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OPERATION

FRICK® QUANTUM™ HD COMPRESSOR CONTROL PANEL

Version 10.1x



TABLE OF CONTENTS



SECTION 4

SECTION 5

SECTION 6

SECTION 1

INTRODUCTION TO THE QUANTUM™ HD CONTROL SYSTEM

COMPRESSOR WITH QUANTUM™ HD CONTROL PANEL

INTRODUCTION TO THE FRICK QUANTUM™ HD

Frick Compressor packages may be used individually, or in groups. This section will describe some of the various configurations that may be used with regard to electrical control.

Each individual Compressor unit is controlled by a computer based machine control system, known as the Quantum™ HD control panel. This controller continuously monitors the conditions and operation of the compressor unit and the various subsystems. It also directs the operation of components. It is fully self-contained.

The Quantum™ HD control panel user interface is used to display graphic screens, which represent various aspects of compressor operation. By using the touch screen, the labeled or described function is recognized by the control processor, and appropriate action is taken.

Although the primary means of operator interaction to the compressor package is via the built-in Quantum™ HD control panel, there are two additional methods that emulate the graphic control screens that may be used remotely for compressor control. The following information is presented to help the operator interact with these graphic screens.

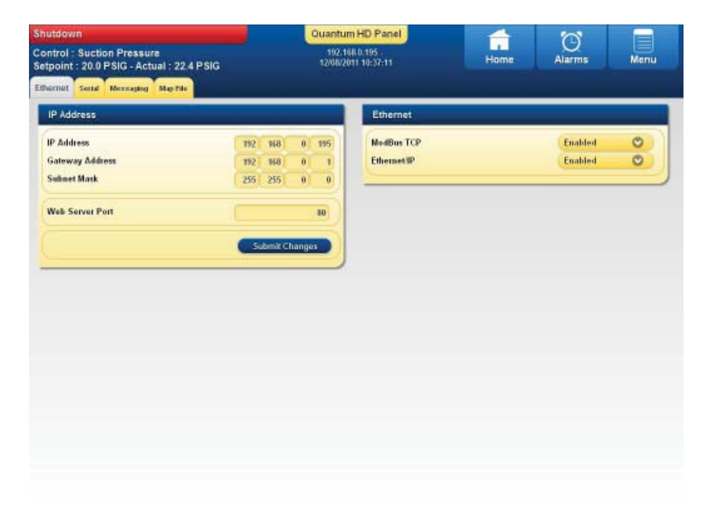


USING A WEB BROWSER (ETHERNET)

The Quantum™ HD Compressor interface may be accessed using the current versions of Google Chrome, Mozilla Firefox, Internet Explorer or Safari web browsers. This feature allows any screen to be viewed from a remote location without specialized software. An Ethernet connection to the Quantum™ HD panel must be provided to utilize this feature.

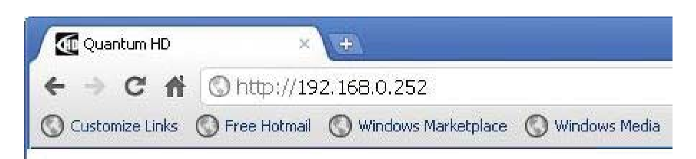
The web browser interface can be viewed from any desktop or laptop computer, notebook, tablet or smart phone which have access to the network that the Interface panel is attached to.

Access the Ethernet Configuration screen at the Interface Panel, by selecting **[Menu]** > **[Configuration]** > **[Communications]** > **[Ethernet]**. The following screen will be shown:



Note the values that are displayed in the four boxes of the IP Address.

At the computer, open the Internet browser (click on your Internet icon). Once the browser has opened, look for the address bar, it will appear similar to the following (the image shown will vary based upon the browser being used):



On the address bar, type the following **[http://]**. Do not type the brackets. After the http:// type in the values of the four boxes from IP Address of the Ethernet Configuration screen. Place a period (dot) between each group of numbers. Using the screen information example used here, the result would be http://192.168.0.252. Your particular IP Address may vary from the example shown.

Press the **[Enter]** key on your computer keyboard, and if everything is connected and configured properly, the Home screen of the Interface Panel should now appear on your computer screen (similar to the following):



If you experience problems, such as a message stating "Page not found", consult with your IT department or internet provider.

To change screens, setpoints, etc., you simply use a mouse and the keyboard to view and change data.

All Interface screens will have three buttons at the top right of the screen (**NOTE:** Upon initial power up, the **[Menu]** button is replaced by a **[Login]** button. After the user has logged in, the **[Login]** button will be replaced by the **[Menu]** button):

> **[Home]** - Select this button if you wish to return to the Home screen (shown above).
>
> **[Alarms]** - Select this button if you wish to view/clear any current alarms.
>
> **[Menu]** – Selecting this button will cause the main menu pop-up to appear. It will be super-imposed over which ever screen is currently being shown. The Menu is how you will navigate through all other screens.

Once the web browser has established connection with a panel, navigation is accomplished by using the computers mouse to maneuver a pointer to mimic the actions of a finger on the touchscreen.

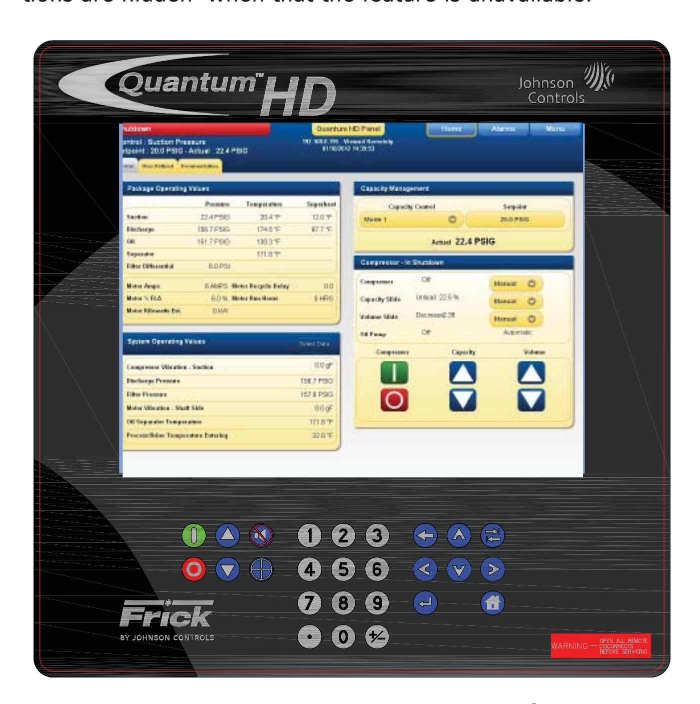
OPERATOR ACCESS AND DATA ENTRY

OPERATOR ACCESS

The Quantum™ HD control panel contains the necessary control hardware and software within one self contained enclosure, and is mounted to the compressor package. The front of this control enclosure contains a graphic display with an integrated touchscreen to allow the operator to access essential information and to make necessary adjustments to setpoints, calibrations and features.

Operator access to this system is through various screens. A screen is the physical representation of data on the display. Each screen has a title area. The title is descriptive of the screen. The current date and time is shown in this title area. The day of the week, Sunday (Sun.) through Saturday (Sat.) is displayed, as well as the month of the year from January (Jan.) to December (Dec.), the day of the month from 1 to 31 and the year from 0001 to 9999 is displayed and the time displayed is the current time in 24 hours (military) format. The hours, minutes and seconds are displayed.

Some screens are for informational purposes only, and cannot be modified. These screens typically show analog values such as temperature and humidity, which are strictly functions of an associated sensor, and as such, cannot be modified. Other screens show setpoint values which can be changed, in order modify the units operating characteristics. For easier viewing, related information is separated into boxes. Sometimes selections are hidden when that the feature is unavailable.



THE QUANTUM™ HD PANEL DISPLAY/KEYPAD

DATA ENTRY

The primary reason for entering data into the Quantum™ HD is for the purpose of modifying setpoints and calibration data. Setpoints and calibration data define the operation and limits of each unit, and will vary from one unit to the next. This data can be changed by operators in the field, or remotely through a web browser if they have been assigned the proper level of access (to be discussed later). These setpoints are stored on the Compact Flash card.

As mentioned earlier, accessing a panel through a web browser is one way of interacting with it. Perhaps the most common method though would be to access the panel at the unit itself. The actual screen navigation is nearly identical. The sections that follow will work in either instance.

NOTE: Setpoints, calibration data, custom names, etc. are not lost after power is interrupted. However, it is suggest that a list of Setpoints be recorded and stored safely to facilitate reentry, in case there is a need to return to the original settings.

1. The data entry fields for both setpoints and calibration are identified by rectangle with blue text inside. On a screen that has adjustable setpoints, select the setpoint rectangle that you wish to modify (or select it on a web browser). An example of a setpoint box appears here:



2. If the setpoint is adjustable, a pop-up keypad will be super-imposed over the current screen (to be described later). The current value of that setpoint is shown. Use the keypad to enter the new value. Typing a new value will completely erase the old value.

3. Press the keypad **[ENTER]** button to input the new data from the data entry field.

4. If the data entered into the setpoint box is valid, it will be accepted, and the keypad will disappear, returning to the current screen. If however, the value entered is not within the acceptable range for the particular setpoint being changed, an Out Of Range pop-up box will appear, which provides what the acceptable range is. Enter a value that is within this range and select the **[ENTER]** button.

Instructions for entering alphabetic data, and additional information will be provided on the following pages.



KEYS AND KEYPAD FUNCTIONS

The Quantum™ HD keypad is divided into three major sections:

Control **Data Entry** **Navigation**

The following is a list of the labeled keypad buttons and the actions that occur when they are pressed:

Key	Function
	[STOP] - When the compressor is running in Manual Mode, pressing this key immediately stops the compressor by placing it into Stop Mode. The compressor is stopped regardless of any other conditions.
	[START] - When in Manual Mode, this key places the compressor unit into the Start Mode for running.
	[UNLOAD] - Unloads Capacity.
	[LOAD] - Loads Capacity.
	[ALARM SILENCE] - Immediately silences a sounding alarm and turns off the alarm annunciation device that is connected to this panel.
	[CALIBRATE] - This button will initiate the Calibration sequence.
1	NUMERAL **[1]** - Enter a value of 1 in a data field.
2	NUMERAL **[2]** - Enter a value of 2 in a data field.
3	NUMERAL **[3]** - Enter a value of 3 in a data field.
4	NUMERAL **[4]** - Enter a value of 4 in a data field.
5	NUMERAL **[5]** - Enter a value of 5 in a data field.
6	NUMERAL **[6]** - Enter a value of 6 in a data field.
7	NUMERAL **[7]** - Enter a value of 7 in a data field.
8	NUMERAL **[8]** - Enter a value of 8 in a data field.

Key	Function
9	NUMERAL **[9]** - Enter a value of 9 in a data field.
0	NUMERAL **[0]** - Enter a value of 0 in a data field.
•	DECIMAL **[.]** - This key is used when entering a decimal value in a data field.
+/-	**[+/-]** - When changing a value in a data field, this key toggles the value between negative and positive.
	[BACKSPACE] - Pressing this key will cause the current location of the cursor to backup one position per key depression. When changing a value in a data field, this key will delete the selected character.
	[DOWN ARROW] - Provides downward navigation within the MAIN MENU window.
	[RIGHT ARROW] - When in the mode of changing a data entry field, this key is used to go to the next character.
	[ENTER] - When changing data in a data entry field, this key will accept the change. This key is also used to select items on Menu Windows.
	[UP ARROW] - Provides upward navigation within the MAIN MENU window.
	[TAB] - When in the mode of changing setpoints, pressing this key will cause the cursor to jump to the next data entry field.
	[LEFT ARROW] - When in the mode of changing setpoints, this key is used to go to the previous data entry field. When the MAIN MENU is shown, pressing this key will cancel the window.
	[HOME] - Shows the MAIN MENU window. This window shows the main selections for accessing information, setup of options, and setpoint entry.

ENTERING AND CHANGING DATA

Although the physical keypad (shown on the previous page) is available for data entry, the easiest method is by using the built-in virtual keyboard and keypad. The virtual keyboard and keypad are very intuitive in their design and layout, however, a detailed explanation of both is provided in the following paragraphs.

POP-UP KEYBOARD

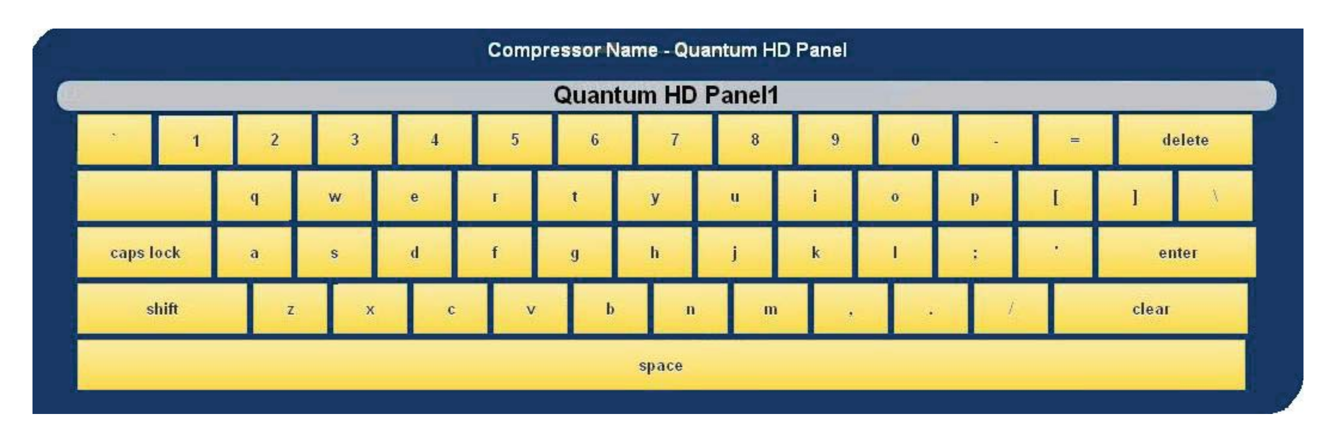
Selecting certain boxes of some screens will cause an alpha-numeric keyboard to pop-up, and will be superimposed over the current screen. This keyboard allows for alphabetic as well as numeric and a limited amount of special characters to be entered.

Some examples of boxes (or tags) that will cause this keyboard to appear are:

- Compressor Name
- Compressor Serial Number
- User Defined - Maintenance
- Save Setpoints
- Auxiliary Analog Names

The grey bar that appears at the top of the keyboard contains the current value or name. Use the keyboard much the same as you would a physical keyboard, to change the current value to what you would like it to say. When you are finished entering the data, simply select the **[Enter]** button on the keyboard to accept the data and return to the current screen.

This keyboard is shown below:



POP-UP NUMERIC ENTRY KEYPAD

Selecting setpoint data boxes will cause a numeric-only keypad to pop-up, and will be superimposed over the current screen. This keypad allows for numeric-only data entry to be entered.

Some examples of setpoint boxes (or tags) that will cause this keypad to appear are:

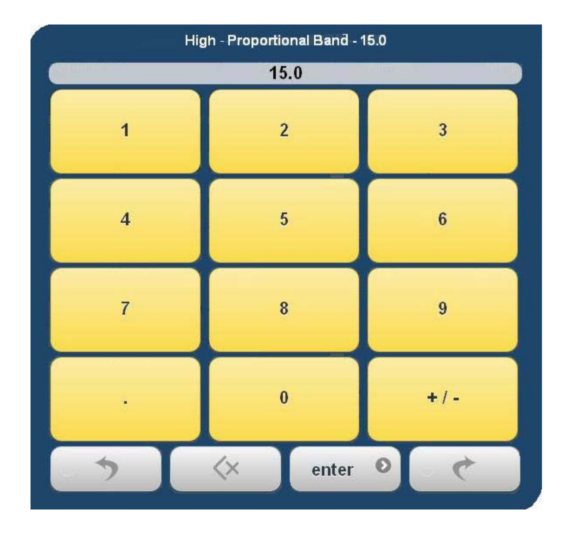
- Suction Pressure and Temperature
- Discharge Pressure and Temperature

The title at the very top of this pop-up gives the name of the setpoint that is being viewed.

The grey bar that appears at the top of the keypad contains the current value. Use the keypad to change the current data value to what you would like it to read. When you are finished entering the data, simply select the **[Enter]** key on the keypad to accept the data and return to the current screen.

The symbol <X at the bottom of the keypad is the same as a backspace, and will cause the right-most digits to be erased one at a time. The left and right arrows at the bottom of the keypad will cause a Select Units pop-up to appear, which will allow the user to select between PSIG or Hg, for a pressure (see the next dialog section for information).

This keypad is shown below:





POP-UP SELECT UNITS BOX

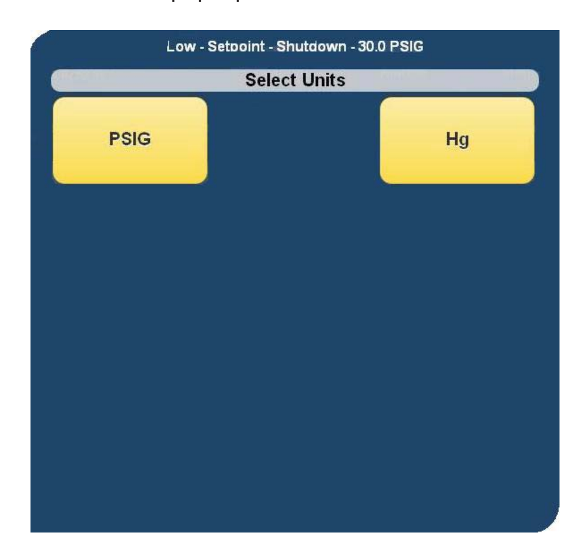
If a pressure value has been entered via the numeric keypad, which would cause confusion as to whether the value should be in PSIG or Hg, a new pop-up box will appear, asking the user to select the units that they wish to have applied to the value. The selections are:

- PSIG
- Hg

The title at the very top of this pop-up gives the name of the setpoint that is being viewed.

The grey bar that appears near the top of the box will give the title of the box, in this case it will say Select Units. Simply select the unit measure that you would like to use, and the numeric keypad will replace this box.

The Select Units pop-up menu is shown below:



POP-UP OUT OF RANGE BOX

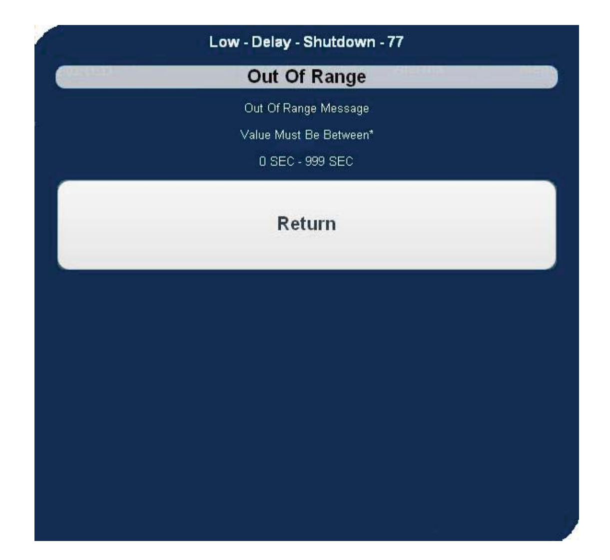
If any numeric value that is entered is outside of the acceptable range for that setting, an Out Of Range pop-up box will appear.

The title at the very top of this pop-up gives the name of the setpoint that is being viewed.

The grey bar that appears near the top of the box will give the title of the box, in this case it will say Out Of Range.

The acceptable range for this setpoint will be given. Selecting the Return button will return you to the Numeric Keypad entry box. Ensure that the value that you enter falls within the acceptable range.

The Out Of Range pop-up menu is shown below:



SECTION 2

SCREEN AND MENU NAVIGATION



NAVIGATION ICONS

At the top right of each screen, you notice three buttons (or icons). When the panel is first powered up they will appear as follows:



The names and functions of these three icons are:

- **Home** - Selecting this button will always return you to the Home screen.
- **Alarms** - Selecting this button will cause the Alarms screen to appear. The Alarms screen allows the user (at any privilege level) to view and clear any active alarms or shutdowns.
- **Login** - This icon will only be present upon initial power up. Selecting this icon will cause the Numeric Keypad (explained earlier) to appear. If you have been given a privilege access code, you will enter it here. If the code is not valid, you will be prompted to re-enter it. If you do not have an access code, you will be limited to only accessing the buttons mentioned above. If however, you enter a valid access code, the three buttons will be replaced by the following three buttons:



The names and functions of the first two buttons are the same as previously stated (Home and Alarms). The third button (which was previously Login) is now replaced with the following:

- **Menu** - Selecting this button will cause the navigational menu (which is determined by your assigned access level) to be superimposed over the current screen.

These three buttons will also appear on the Navigation Menu, and are available at all privilege levels.

NAVIGATION MENU

Navigating between the various screens is accomplished by accessing the Navigation Menu. The appearance of this menu will vary depending upon what user privilege level has been assigned to you.

The various levels of access are:

Basic - This level provides access to what is typically needed for day to day operation. The factory default password is 1. The following menu icons are available in this level:

- Home
- Events
- Trending
- About
- Status
- Alarms
- Clean Screen Mode

Operator - This level allows access to all Basic level icons. The factory default password is 2. The following



additional menu icons are available:

- Control Setpoints
- Calibration

Service - This level allows access to all Basic and Operator level icons. The factory default password is 3. The following additional menu icons are available:

- Service
- Configuration

This menu is accessible by selecting the Menu button at the top right of any screen. The diagram on the next page shows the tree structure of which screens are accessible through each menu button. The pictorial shown below represents the Navigation Menu based upon the highest user privilege (Service):



MENU NAVIGATION

Basic Access

- Events
- Trending
  - Real
  - Historical
- About
- Status
  - Vyper Info
  - Filter Info
  - Panel
    - Analog
    - Digital
    - Comms 1-3
    - I/O Comms
    - Comm 1 - 3 Log
    - I/O Comms Log
    - ModBus TCP Log
  - DBS Starter Info
  - Remote Users
- Alarms
- Screen Clean Mode

Operator Access

- Control Setpoints
  - Capacity Control
    - Capacity 1 - 4
  - PI Control
    - PI Control 1 - 8
  - Condenser Control
  - Sequencing Control
    - System 1
      - Order
      - Control
    - System 2
      - Order
      - Control
    - System 3
      - Order
      - Control
  - Liquid Injection LIOC
- Calibration
  - Pressure
  - Temperature
  - Capacity Volume
  - Motor Drive
  - Auxiliaries
    - Aux Inputs A - J
    - Aux Inputs K - T
  - Outputs
  - PHD Monitor
  - Misc

Service Access

- Configuration
  - Package
    - Package
    - Oil Pump / Lubrication
    - Liquid Injection
    - Dx / Chiller Control
    - Options
      - Discharge Butterfly Valve
      - Separator Condensing
      - Separator Dewpoint
  - Compressor
  - Drive
    - Motor
    - DBS Starter
    - VFD
    - Vyper
      - Control
      - Cooling
    - Engine / Turbine
  - Capacity Control
    - Capacity Modes
    - Mode Scheduling
    - Leaving Process Safeties
  - Discharge / Suction / Oil
    - Discharge
    - Suction / Oil
    - Limits
  - Digital Auxiliaries
    - Digital Aux Inputs
      - A - T
    - Digital Aux Outputs
      - A - J
    - Timed
      - Run Time Control
      - Scheduled Control
  - Analog Auxiliaries
    - Aux Analog Inputs A - T
  - Panel
  - Communications
    - Ethernet
    - Serial
    - Map File
  - Security
  - Sequencing
    - System 1 - 3 Setup
      - Order
      - Control
  - Condenser
  - PHD Vibration / Temperature
    - Compressor Bearing
    - Motor Bearing
    - Motor Stator
  - Proportional / Integral Control
    - PI Control 1 - 8
  - Superheat Control
    - Superheat 1 - 3
  - Retransmitting Outputs
    - A - P
  - Digital I/O
    - Page 1 - 4
  - Analog I/O
    - Analog Pages 1 - 3
    - VSD Outputs
  - PLC I/O Control
- Service
  - Oil Pump
  - Maintenance
    - User Defined
    - Factory
  - Communications
  - Diagnostics
  - Software



NOTES:

SECTION 3

OPERATING DISPLAY SCREENS



DESCRIPTION: This is the default screen (also called the Home screen). Once the Quantum™ HD has booted, this screen will appear. The most important information about the compressor and the applicable subsystems operation is displayed here. The Operating Status screen is continuously updated and provides a variety of information with regard to the current condition and performance of the compressor unit and subsystem This screen is divided into five sections:

HEADER - The Header area appears at the very top of the screen and is common to all screens. Each screen Header provides the same information, as well as a method of accessing additional screens. The information and access features appear here:

Normal/Warning/Shutdown Status Bar - If either a Warning or Shutdown condition is encountered, it will be notified with white text on a red background in the upper left corner of the Header, as shown on the screen above. If there are no warnings or shutdowns, this area will display Normal in white text on a green background. To view what Warnings or Shutdowns are active, press the **[Alarms]** icon.

The definitions for the two messages are:

Warning - A message appears when a warning is present. The message indicates that a warning setpoint has been reached, or exceeded, and requires operator acknowledgement - but allows the compressor to continue to run if it is already running.

Shutdown - A message appears when a shutdown has occurred. The message indicates that a shutdown setpoint has been reached, or exceeded, and requires an operator to acknowledge, and causes the compressor to shut down.

Panel Name - If a customized panel name has been entered for the panel, it will appear at the very top center of the Header. To change the Panel Name, perform the following icon selections:

Select the **[Menu]** icon > **[Configuration]** > **[Compressor]**.

The Compressor screen will now be shown. In the box that is entitled Compressor Info, is a line called Compressor Name. To the right of Compressor Name is a setpoint box. By clicking on this setpoint box, a keypad will appear allowing the name to be changed.

Control - This will display the current control mode.



In the case of the screen shown, it is Suction Pressure.

Setpoint - This will display the setpoint value that has been assigned for the Control.

Actual - This will show the Actual value of the Control input.

Date - The actual date will be displayed at the center of the Header, to the left of the time. The date must first be set correctly on the Configuration screen. Once set, the date will be automatically adjusted for at the end of each month, much like the calendar feature of most modern watches. The primary use of the date feature is to provide a date stamp for Warnings and Shutdowns.

TIME - The actual time will be displayed in this box. The time must first be set correctly on the Configuration screen. The time will also need to be adjusted for those locations which observe Daylight Savings Time. The primary use of the time feature is to provide a time stamp for Warnings and Shutdowns.

PACKAGE OPERATING VALUES - This box area will show certain critical package transducer and sensor readings. Temperature and pressure information as well as motor related data will be constantly monitored and shown. If additional are required to be viewed from this screen, they may be setup and viewed in the *System Operating Values* box.

The following information is displayed:

Suction

Pressure - Is measured at the compressor inlet and the value is displayed along with the unit of measure.

Suction Temperature - Is measured at the compressor inlet and the value is displayed along with the unit of measure.

Superheat - The temperature of the gas at saturation temperature for a given period of time. Superheat is the term used to describe the difference between the vapor point (i.e., the temperature at which the refrigerant evaporates at a given pressure) and the actual temperature of the refrigerant gas entering the compressor .

Discharge

Pressure - Is measured at the compressor outlet and the value is displayed along with the unit of measure.

Temperature - Is measured at the compressor outlet and the value is displayed along with the unit of measure.

Superheat - The temperature of the gas at saturation temperature for a given period of time. Superheat is the term used to describe the difference between the vapor point (i.e., the temperature at which the refrigerant evaporates at a given pressure) and the actual temperature of the refrigerant gas exiting the compressor.

Oil

Pressure - The Oil Pressure is measured prior to entering the compressor and the value is displayed along with the unit of measure.

Temperature - The Oil Temperature is measured prior to entering the compressor and the value is displayed along with the unit of measure.

Separator

Temperature - The Oil Separator Temperature value is displayed along with the unit of measure.

Filter Differential - If applicable.

Pressure - Shows the pressure drop across the oil filter. The main oil injection oil filter pressure drop value (differential) is displayed along with the unit of measure.

Economizer - If applicable.

Pressure - The Economizer Pressure is measured and the value is displayed along with the unit of measure.

Motor Amps - The actual motor amps.

Motor Recycle Delay - This message shows the remaining time in minutes for Recycle Delay. If the compressor has started and shuts down within the recycle time delay setpoint period, the Recycle Delay will prevent the compressor from starting until the delay time expires. This time delay is intended to prevent damage to the compressor motor from successive restarts.

Note: The remaining recycle delay time can be cleared from the Motor screen

Motor %FLA - The percentage of the drive motor full load amperage rating that the motor is currently using: % (FLA x SF)

Motor Run Hours – The total amount of time in hours that the compressor motor has run.

Motor Kilowatts Est. - The actual calculation of the kilowatt usage of the compressor motor. It is

based on the calculation of KW = (√3 x V x A x PF) / 1000.

SYSTEM OPERATING VALUES - This box area allows the user to customize up to six pre-defined data channels to display and monitor. Use this box to show additional channels that you wish to monitor that aren't already provided in the other areas of this screen. To assign these channels, press the **[Select Data]** icon.

A menu will appear showing the pre-defined possible data channels. Simply click on the channel that you wish to add (NOTE: A maximum of six may be selected at the same time):

Auxiliary Analog 1-20
Balance Piston Pressure
Capacity Slide Position
Compressor Oil Pressure
Compressor Oil Temperature
Compressor Vibration – Discharge
Compressor Vibration – Suction
Discharge Pressure
Discharge Temperature
Economizer Pressure
Filter Pressure
Intermediate Pressure
Kilowatts
Main Oil Injection Pressure
Manifold Pressure
Motor Current
Motor Stator #1 - #3
Motor Temperature – Opposite Shaft Side
Motor Temperature – Shaft Side
Motor Vibration – Opposite Shaft Side
Motor Vibration – Shaft Side
Oil Separator Temperature
Process/Brine Temperature Entering
Process/Brine Temperature Leaving
RPM
Remote Capacity Position
Remote Control Setpoint
Suction Pressure
Suction Temperature
System Discharge Pressure
Volume Slide Position
Vyper Coolant Temperature (if installed)

CAPACITY MANAGEMENT

Capacity Control - A drop down selection box is provided to select and display one of the following:

- Mode 1
- Mode 2
- Mode 3
- Mode 4

Setpoint - A setpoint box is provided to allow the user to set the value at which to control to. This value is also shown in the Header on all screens.

Actual - This will show the Actual value of the Control input. This value is also shown in the Header on all screens.

COMPRESSOR (Current Start Status is shown)

Start Status - One of the following messages may be shown:

Ready - The Compressor is ready to start.

Start Inhibit In Shutdown - Compressor is not able to start. A Shutdown alarm is present. A Start command is required when the unit is in Ready status.

Start Inhibit In Recycle Delay - Compressor is not able to start. The Compressor Recycle Delay time is timing out. A Start command is required when in the unit is in Ready status.

Start Inhibit High Discharge Temperature - Compressor is not able to start. The Discharge temperature is above it's Shutdown setpoint. A Start command is required when in the unit is in Ready status.

Start Inhibit High Oil Temperature - Compressor is not able to start. The Oil temperature is above it's Shutdown setpoint. A Start command is required when in the unit is in Ready status.

Start Inhibit Low Separator Temperature - Compressor is not able to start. The Separator temperature is below it's Shutdown setpoint. A Start command is required when in the unit is in Ready status.

Start Inhibit Slide Valve Too High - This will set the Compressor *Run Status* to Starting status and then transition to Running when the Slide Valve is below the "Highest Capacity To Permit Starting" setpoint.

Start Inhibit Still In Prelube - A Start command has already been sent. The Compressor Run status is Starting and will transition to Running when the oil pump pre-lube is complete.

Start Inhibit High Suction Pressure - The Compressor is not able to start. The Suction pressure input is at its high end of the sensor range. A Start command is required when in the Ready status.

Start Inhibit High Suction/Discharge Differential - The Compressor is not able to start. The Suction/Discharge differential pressure is above the "Start Differential" setpoint. A Start command is required when in a Ready status.

Start Inhibit Permissive Start - The Compressor is not able to start. The Permissive Start input is off. A Start command is required when



in a Ready status.

Start Inhibit Digital Auxiliaries - This will set the Compressor *Run Status* to Starting status and then transition to Running if the Digital Auxiliary input is On before the end of the delay time.

Power Fail Restart - The Compressor is not able to start. Power Fail Restart is enabled and delay timer has not timed out. Tis only occurs in Compressor Auto Mode. A Start command is required when in a Ready status.

Start Inhibit Low Oil Pressure - This will set the Compressor *Run Status* to *Starting* status and then transition to *Running* when the Oil Pressure is 10 PSI above the Low Oil Pressure Shutdown setpoint. This is only used with "Other Manufacturer" compressor type.

Running - A Start command has already been sent, and the Compressor is running.

Start Inhibit In Discharge Pressure Blowdown - The Compressor is not able to start. This is only used on RCSI systems.

Start Inhibit Separator Condensing

Compressor - Shows the present operating status of the compressor and from what source it has been initiated:

- Off
- Running
- Starting
- Stopping
- Stopping - High Capacity
- Stopping - Pumpdown
- Stopping - Cool Down Period

A drop down menu icon is provided to select from the following Compressor controls options:

- **Manual** - A compressor manual start or stop command was sent.
- **Automatic** - The compressor auto command was sent. The compressor starting and stopping is being controlled from automatic cycling control setpoints at the panel. The automatic cycling control setpoints of the active capacity control are used.
- **Remote Comm** - The compressor remote communications command was sent. The compressor starting and stopping is through the serial Comm3 channel.
- **Remote IO** - The compressor remote I/O command was sent.
- **Remote Seq** - The compressor remote sequencing command was sent.

Note: If there is a shutdown in response to a safety setting, a compressor in Remote or Automatic mode is placed into Manual mode requiring operator intervention.

Capacity Slide - Shows the current status of the Capacity Slide as either Idle, Load or Unload - along with the percentage. A drop down selection box is provided to select what source to use to control the Capacity Slide Valve.

- Manual
- Automatic
- Remote Comm
- Remote IO
- Remote 4-20 Input
- Remote Seq

Volume Slide - Shows the current status of the Volume Slide as either Idle, Increase or Decrease - along with the percentage. A drop down selection box is provided to select what source to use to control the Volume Slide Valve.

- Manual
- Automatic

Oil Pump - (If selected in Configuration) – The On or Off message is shown for the status of the oil pump. The Manual or Auto message is shown to indicate the position of the HAND-OFF-AUTO switch. If dual pump control was enabled in Configuration, the lead pump (either Oil Pump 1 or Oil Pump 2) is shown.

The lower half of the Compressor box shows three columns of interactive buttons, which duplicate the functions of the physical keypad buttons:

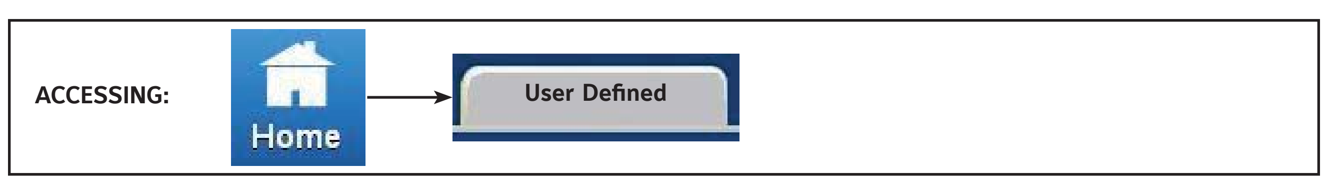
- Compressor
- Capacity
- Volume

NOTE: A forth set of buttons may be present if a variable speed drive is selected, to increase or decrease the motor speed.

HOME

User Defined





DESCRIPTION: The purpose of this screen is to allow the user to assign additional analog channels to be more readily viewable. Since the main Operating Status screen is capable of only showing a limited number of preassigned analog values, it may be desirable for the user to have a method of viewing additional information that they can select, on a common screen.

This screen is provided to allow the user to view up to 51 different analog channels of their choosing.

As an example of how this screen works, assume that in addition to the data that is shown on the Operating Status screen, the user would like to monitor the Capacity Slide Position, Auxiliary Analog Channel 1 and Compressor Vibration –Suction, all on the same screen (this one). Notice that Capacity Slide Position is already shown on the Operating Status screen, but the user would also like to see Auxiliary Analog Channel 1 and Compressor Vibration –Shaft Side on the same screen. In order to set this screen up this way, the user would select the [Select Data] button, and on the pop-up menu that appears, simply select the additional channels that you wish to view. Once selected, a check will appear in the box to the left of the channel selected. When finished, simply select the **[Save Data Points]** button to exit the menu and return to the *User Defined* screen. The changes you made will now appear.

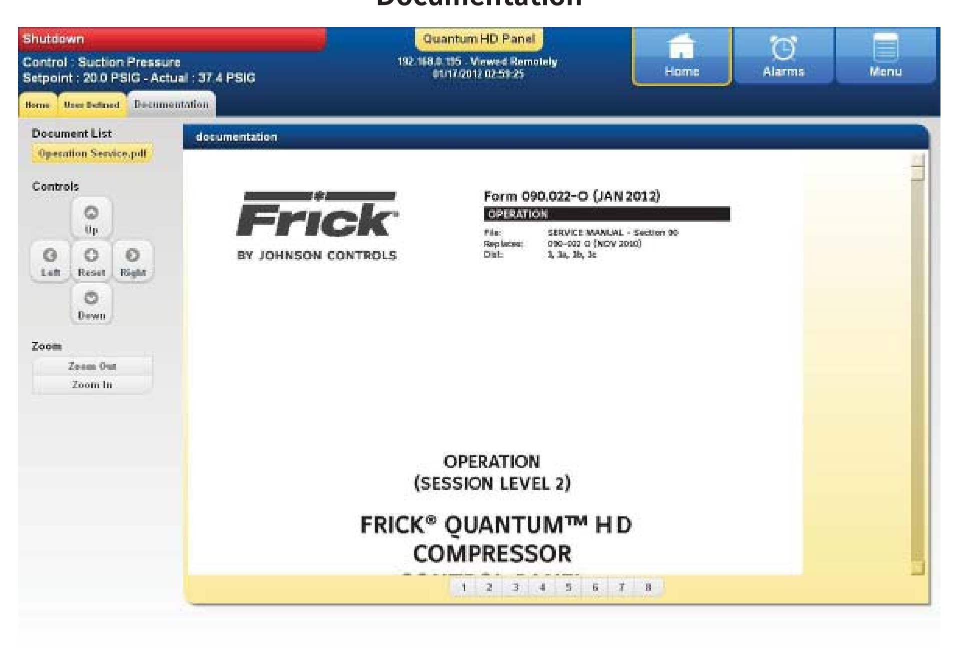
The following selections may be shown on this screen:

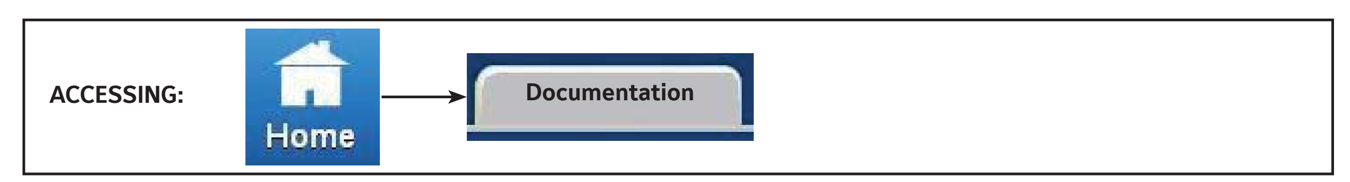
- Auxiliary Analog #1 - #20
- Balance Piston Pressure
- Capacity Slide Position
- Compressor Oil Pressure
- Compressor Oil Temperature
- Compressor Vibration – Discharge
- Compressor Vibration – Suction
- Discharge Pressure
- Discharge Temperature
- Economizer Pressure
- Filter Pressure
- Intermediate Pressure
- Kilowatts
- Main Oil Injection Pressure
- Manifold Pressure
- Motor Current
- Motor Stator #1 - #3
- Motor Temperature – Opposite Shaft Side
- Motor Temperature – Shaft Side
- Motor Vibration – Opposite Shaft Side
- Motor Vibration – Shaft Side
- Oil Separator Temperature
- Process/Brine Temperature Entering
- Process/Brine Temperature Leaving
- RPM
- Remote Capacity Position
- Remote Control Setpoint
- Suction Pressure
- Suction Temperature
- System Discharge Pressure
- Volume Slide Position



HOME

Documentation



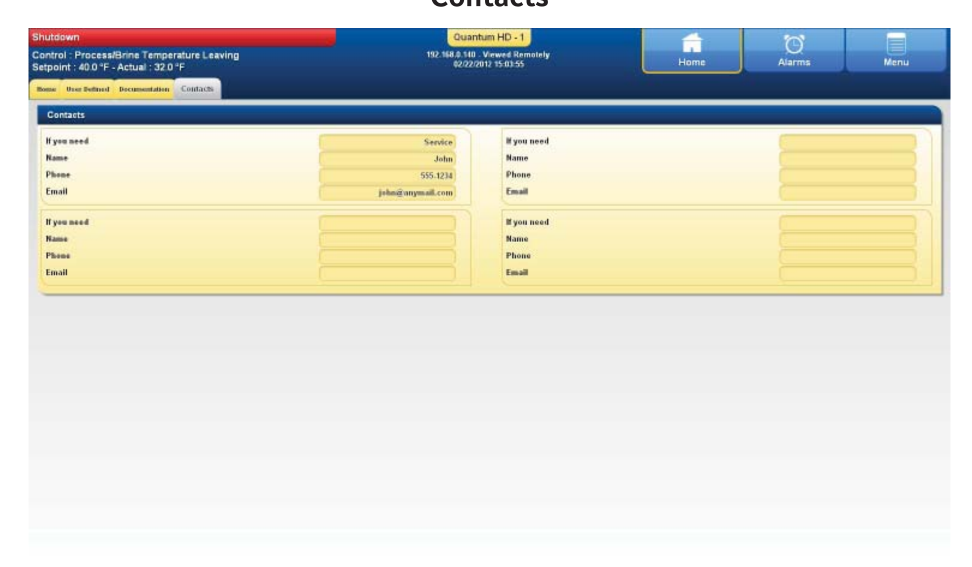


DESCRIPTION: This screen provides the user with links to allow the user to view the manuals shown. These manuals are stored on the Quantum™ HD program flash card.

The screen shown here is only available when viewing from a web browser. It can be viewed by accessing the main Menu, and selecting Documentation. This screen allows the user to access the listed manuals in a PDF format. The manuals are stored internally on the program flash card, and when selected, will be automatically displayed on a new web browser page.

HOME

Contacts





DESCRIPTION: This screen allows the user to create four contacts for various purposes, such as service, parts, etc.

CONTACTS

The following boxes have been provided (**Note: This screen is for informational purposes only, pressing a button on this screen will not summon or contact anyone, it acts simply as a note pad**):

If You Need - Use this box to enter a custom name for such things as Service, Parts, Maintenance, Emergency, etc.

Name - Enter a person or companies name here.

Phone - Enter the phone or beeper number of the person or department for this entry.

Email - You may also enter the email of the person, company, etc.



NOTE: The screens that follow throughout the remainder of this manual are accessed from the Navigation Menu, and availability may be restricted by assigned privilege level, or installed options.

EVENTS

Shutdown
Control : Suction Pressure
Setpoint : 20.0 PSIG - Actual : 22.5 PSIG
Quantum HD Panel
192.168.0.195 -
12/08/2011 11:42:49
Home Alarms Menu

Event Log — Clear Event Log

Stop Process - Process Timeout - modbus	12-08-11 11:42:39
Stop Process - Process Timeout - modbus	12-08-11 11:42:22
Stop Process - Process Timeout - modbus	12-08-11 11:42:06
Stop Process - Process Timeout - modbus	12-08-11 11:41:49
Stop Process - Process Timeout - modbus	12-08-11 11:41:33
Stop Process - Process Timeout - modbus	12-08-11 11:41:16
Stop Process - Process Timeout - modbus	12-08-11 11:41:00
Stop Process - Process Timeout - modbus	12-08-11 11:40:43
Stop Process - Process Timeout - modbus	12-08-11 11:40:27
Stop Process - Process Timeout - modbus	12-08-11 11:40:11
Stop Process - Process Timeout - modbus	12-08-11 11:39:54
Stop Process - Process Timeout - modbus	12-08-11 11:39:37

Next

ACCESSING: Events

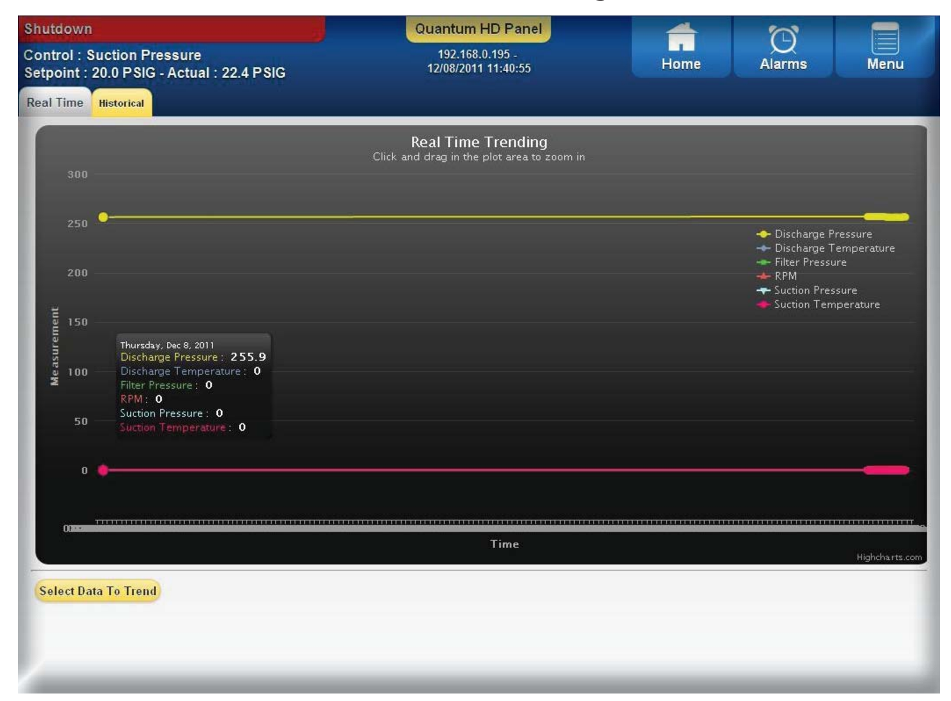
DESCRIPTION: This screen is used to log certain messages and events that are generated through normal unit operation. Occurrences such as normal power up and power down sequences, as well as all maintenance schedule messages (see the Service > Maintenance > Factory screen for more information on these messages).

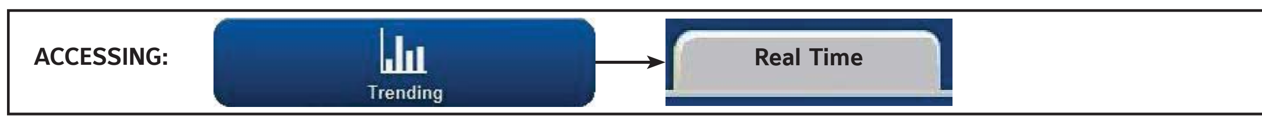
The left side of this screen is numbered for each event which has occurred. Under the Event heading, the specific event will be shown that caused a normal system event.

The column at the right side of the screen shows the date and the time of the event. It is very important to ensure that the correct Date and Time are set, so that the Events that are logged here are accurately represented.

TRENDING

Real Time Trending





DESCRIPTION: This is the Real Time Trending screen. Up to eight analog channels can be monitored in real time fashion in a graphical chart format (as the values are changing).

Each of the possible eight selectable channels will be shown at the right side of the screen, each in a different color. The color data values displayed in the chart correspond to the matching color of the trending channels at the right of the screen. Real Time events are lost upon each power cycle. A total of 1000 data points are saved. Trending files can to downloaded to a USB thumbdrive or over an Ethernet Network and viewed in Excel.

The following button is provided:

Select Data to Trend - When this button has been selected, a pop up menu will appear with all of the possible data channels shown that may be trended. A check box appears at the left side of each channel, and those channels that have been selected to be trended will have this box checked. Up to eight channels may be trended simultaneously.

Once selected, the value for this channel will be automatically trended and shown on the Real Time Trending graph.

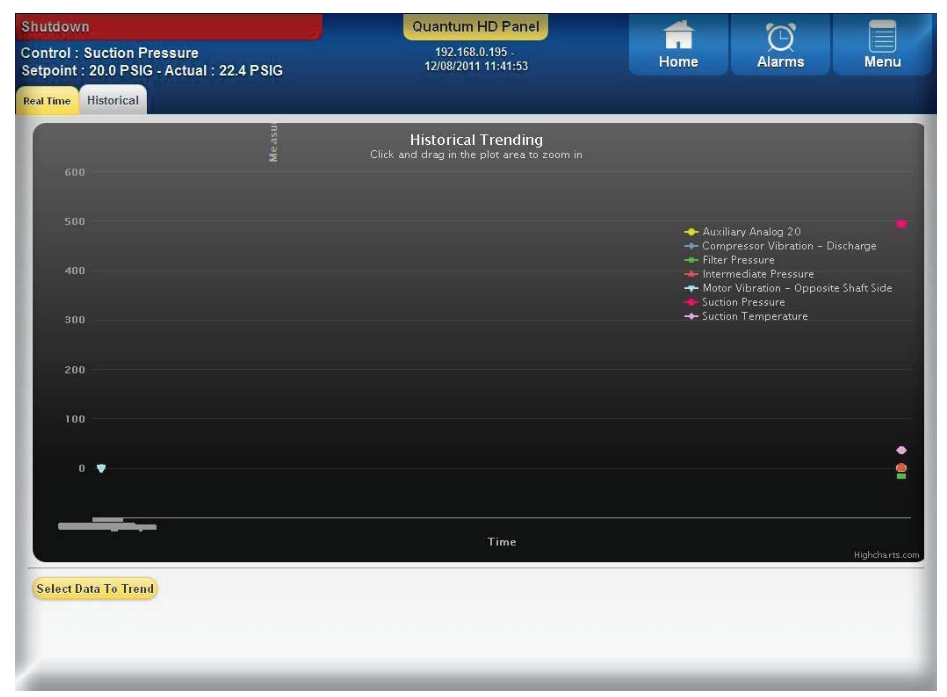
The following list shows the selectable analog channels that may be trended:

- Auxiliary Analog 1-20
- Balance Piston Pressure
- Capacity Slide Position
- Compressor Oil Pressure
  Compressor Oil Temperature
- Compressor Vibration – Discharge
- Compressor Vibration – Suction
- Discharge Pressure
- Discharge Temperature
- Economizer Pressure
- Filter Pressure
- Intermediate Pressure
- Kilowatts
- Main Oil Injection Pressure
- Manifold Pressure
- Motor Current
- Motor Stator #1 - #3
- Motor Temperature – Opposite Shaft Side
- Motor Temperature – Shaft Side
- Motor Vibration – Opposite Shaft Side
- Motor Vibration – Shaft Side
- None
- Oil Separator Temperature
- Process/Brine Temperature Entering
- Process/Brine Temperature Leaving
- RPM
- Remote Capacity Position
- Remote Control Setpoint
- Suction Pressure
- Suction Temperature
- System Discharge Pressure
- Volume Slide Position
- Vyper Coolant



TRENDING

Historical Trending





DESCRIPTION: This is the History Trending screen. It is accessible from the Main Menu by pressing **[Trending]**, then Historical. This screen will display in a graphical chart format, the data values as selected on the Real Time Trending Setup screen. Each of the possible eight selectable channels will be shown at the right side of the screen, each in a different color. The color data values displayed in the chart correspond to the matching color of the trending channels at the bottom of the screen. A total of 5000 data points are saved.

History data is stored in Flash memory. Flash memory is non-volatile and all information is retained even if the power to the panel is lost. Trending files can to downloaded to a USB thumbdrive or over an Ethernet Network and viewed in Excel.

The following button is provided:

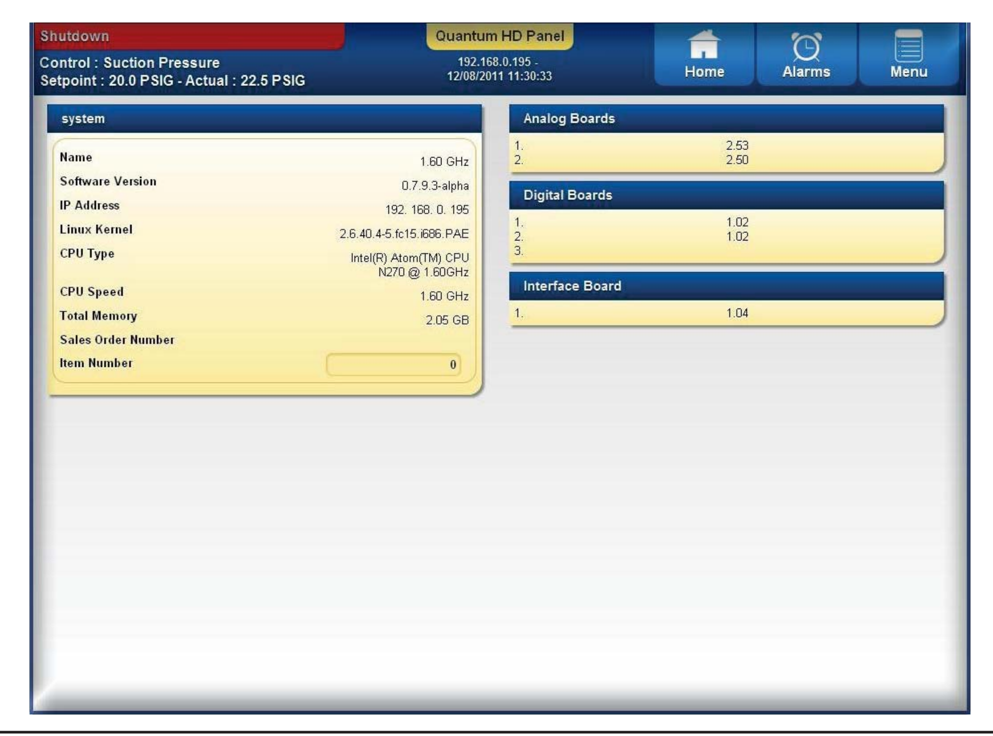
[Select Data to Trend] - When this button has been selected, a pop up menu will appear with all of the possible data channels shown that may be trended. A check box appears at the left side of each channel, and those channels that have been selected to be trended will have this box checked. Up to eight channels may be trended simultaneously.

Once selected, the value for this channel will be automatically trended and shown on the Historical Trending graph.

The following list shows the selectable analog channels that may be trended:

- Auxiliary Analog 1-20
- Balance Piston Pressure
- Capacity Slide Position
- Compressor Oil Pressure
- Compressor Oil Temperature
- Compressor Vibration – Discharge
- Compressor Vibration – Suction
- Discharge Pressure
- Discharge Temperature
- Economizer Pressure
- Filter Pressure
- Intermediate Pressure
- Kilowatts
- Main Oil Injection Pressure
- Manifold Pressure
- Motor Current
- Motor Stator #1 - #3
- Motor Temperature – Opposite Shaft Side
- Motor Temperature – Shaft Side
- Motor Vibration – Opposite Shaft Side
- Motor Vibration – Shaft Side
- None
- Oil Separator Temperature
- Process/Brine Temperature Entering
- Process/Brine Temperature Leaving
- RPM
- Remote Capacity Position
- Remote Control Setpoint
- Suction Pressure
- Suction Temperature
- System Discharge Pressure
- Volume Slide Position
- Vyper Coolant

ABOUT



ACCESSING:	About

DESCRIPTION: This screen shows all I/O boards that have been detected by the Quantum™ HD, as well other related software information and consists of four sections:

SYSTEM

Name - A customized name for that has been assigned for this panel.

Software Version - The version of the software program that does the actual control of the compressor. It runs in the Linux environment.

IP Address - The value shown here represents the IP (Internet Protocol) address that has been assigned to this panel.

Linux Kernel - The Quantum™ HD controller runs on a Linux programming architecture (rather than Microsoft Windows). This is the software version number for the main Linux Kernel.

CPU Type - The information that is shown here describes the CPU micro-chip that is installed on the Q5 control board.

CPU Speed - This indicates the clock rate at which the CPU can perform at.

Total Memory - This shows the total amount of on-board memory that is installed on the Q5 control board.

Sales Order Number - A six digit numerical value that has been assigned to a specific compressor package by Frick Company. It is very important to have this number available when calling the factory for assistance or parts ordering.

Item Number - This is actually an extension of the Sales Order number. It would potentially be used for a multiple compressor site, where the same Sales Order number was assigned for all compressors. The Item Number would be different for each compressor.

ANALOG BOARDS

Shows all analog boards that were detected through communications at the last power up. If a board is detected, the software version of the program running on that board will be shown.

DIGITAL BOARDS

Shows all digital boards that were detected through communications at the last power up. If a board is detected, the software version of the program running on that board will be shown.

INTERFACE BOARD

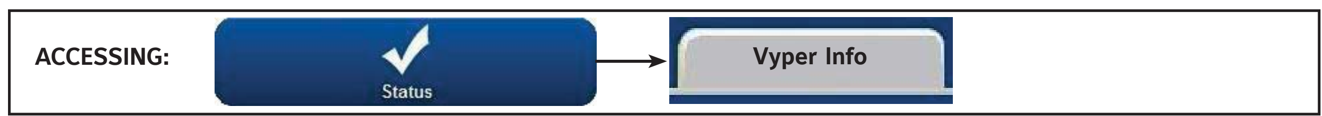
Shows the software version of the program running on the Interface Board board.



STATUS

Vyper Info



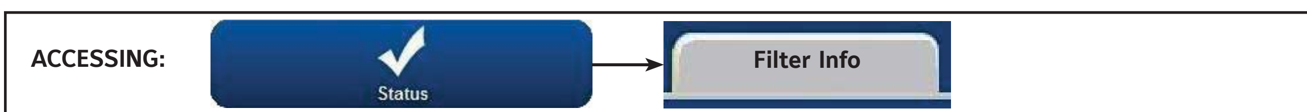


DESCRIPTION: This screen is used to view specific operating values of the Vyper™ drive. These values are received via communications directly from the Vyper™ drive, and populated here.

STATUS

Filter Info





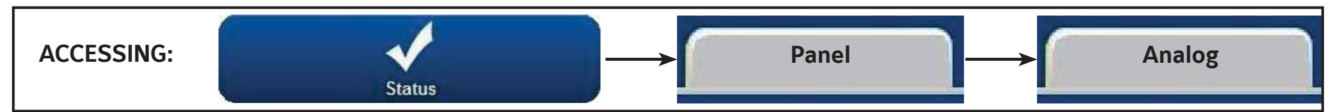
DESCRIPTION: This screen is used to view specific operating values of the Vyper™ drive harmonic filter. These values are received via communications directly from the Vyper™ drive, and populated here.



STATUS

Panel - Analog



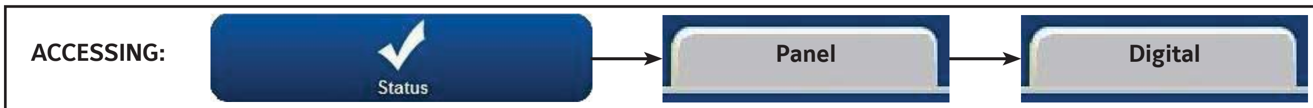


DESCRIPTION: This screen allows the technician to view the status of all installed analog board inputs and outputs. The top section of this screen shows the analog inputs. A value displayed next to each available channel indicates a raw count that can be calculated to a DC voltage that is present as an input. The lower half of the screen shows the analog outputs. A value displayed next to each available channel indicates a raw count that can be calculated to a DC voltage that is present as an output.

STATUS

Panel - Digital



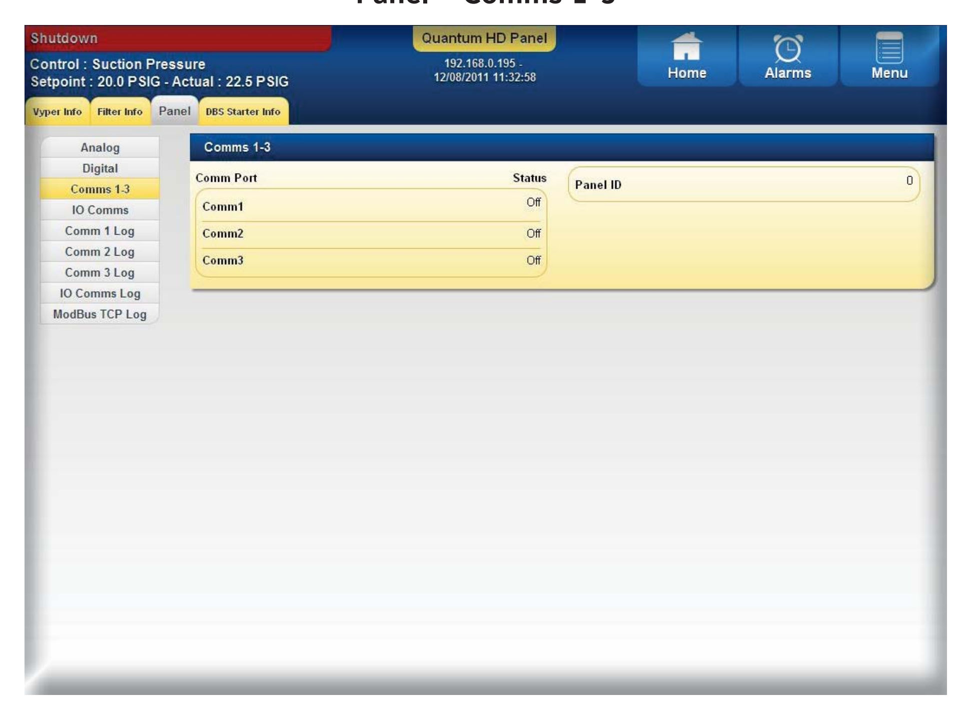


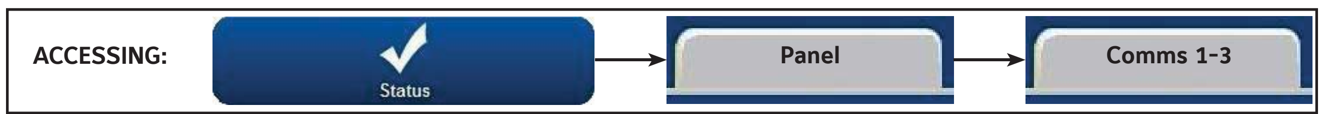
DESCRIPTION: This screen allows the technician to view the status of all installed digital board inputs and outputs. An OFF status indicates that the associated input or output is not energized. An ON status indicates that the associated input or output is energized.



STATUS

Panel - Comms 1-3





DESCRIPTION: This screen shows the current communications status of the three serial communications ports. The Panel ID number is shown at the right side of the screen:

COMMS 1-3

Comm1

- Off
- Active
- Failed

Comm2

- Off
- Active
- Failed

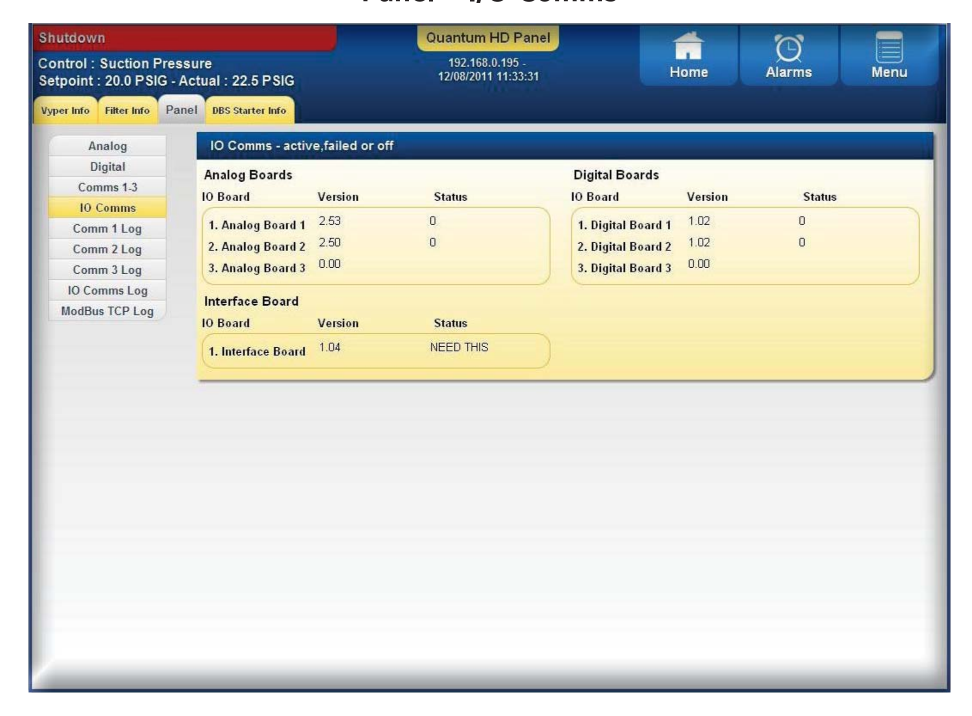
Comm3

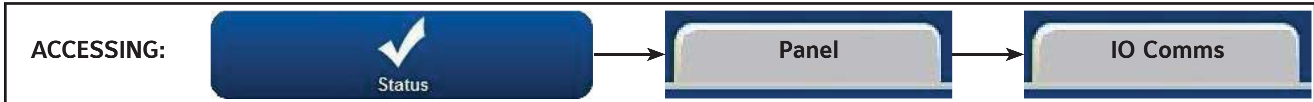
- Off
- Active
- Failed

Panel ID - This setpoint box allows for a distinctive number to be entered that will identify this unit A number that is used by an external communications application, to converse to individual compressors. On interconnected systems, this number must be unique. Valid values are 0 - 99.

STATUS

Panel - I/O Comms





DESCRIPTION: This screen shows the currently active I/O boards that have been detected, as well as the software version of the board, and it's current communication status:

I/O COMMS (Current status is shown)

Analog Boards

Shows all analog boards that were detected through communications at the last power up. If a board is detected, the software version of the program running on that board will be shown, as well as the current status for that board.

Digital Boards

Shows all digital boards that were detected through communications at the last power up. If a board is detected, the software version of the program running on that board will be shown, as well as the current status for that board.

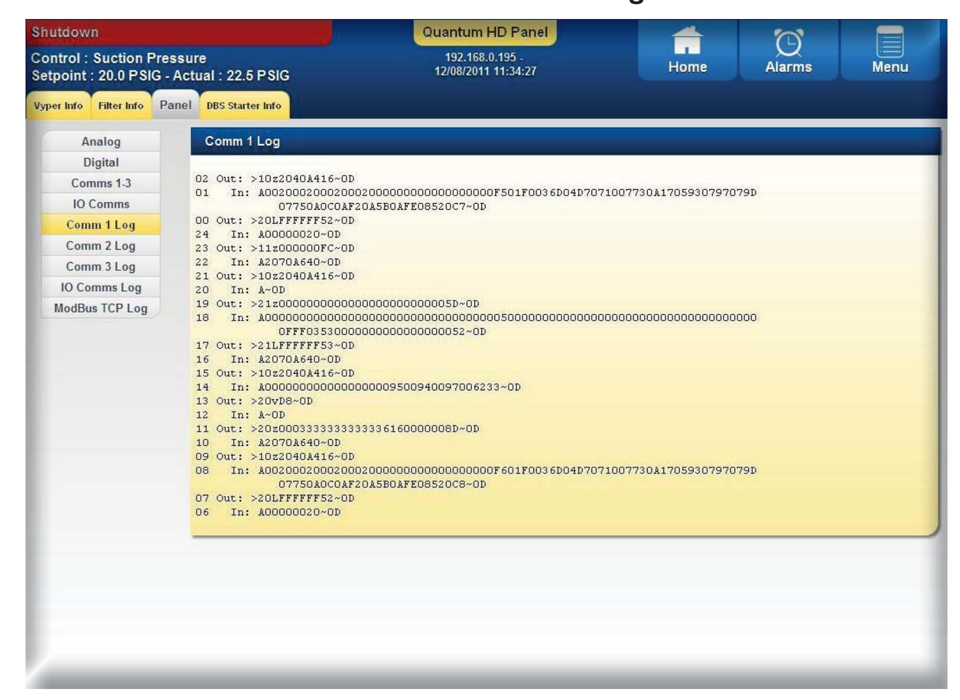
Interface Board

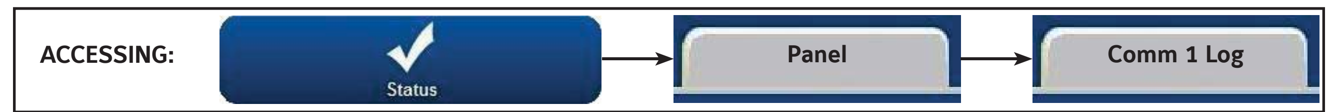
Shows the software version of the program running on the Interface Board board, as well as the current status for the board.



STATUS

Panel - Comms 1-3 Log





DESCRIPTION: These screens allow the technician to view all of the serial communications information via these logs that the Quantum™ HD has received and transmitted.

COMM 1 (2, 3) LOG

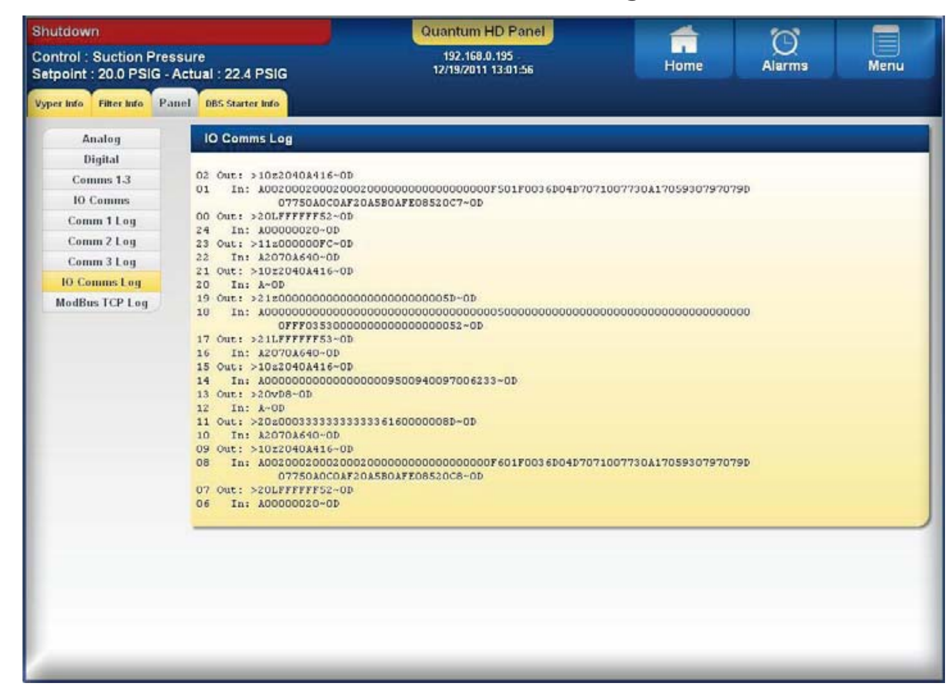
Simply select the Comms 1 Log, Comms 2 Log or Comms 3 Log buttons on the left side of the screen that corresponds to the port that you wish to view. The selected port name (in this case Comm 1 Log) will appear in the blue status bar.

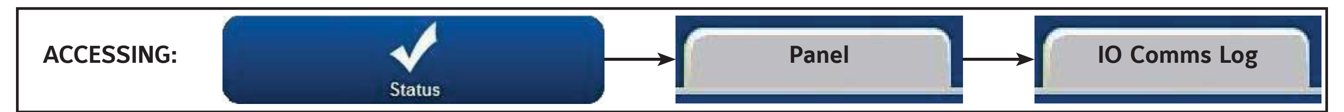
Each time a new command is sent or received, the screen will refresh automatically.

This screen will display all data that is coming through the selected Communications (Comm) port. The top line of data is the most recent activity. At the left of each line, you should see whether the data is IN or OUT (Receive or Send), and the actual data (in Hexadecimal format). This information can be used to compare against the data being sent and received at the other end of the communications link, to verify proper operation.

STATUS

Panel - I/O Comms Log





DESCRIPTION: This screen allows the technician to view all of the serial communications that the Quantum™ HD has received and transmitted.

I/O COMMS LOG

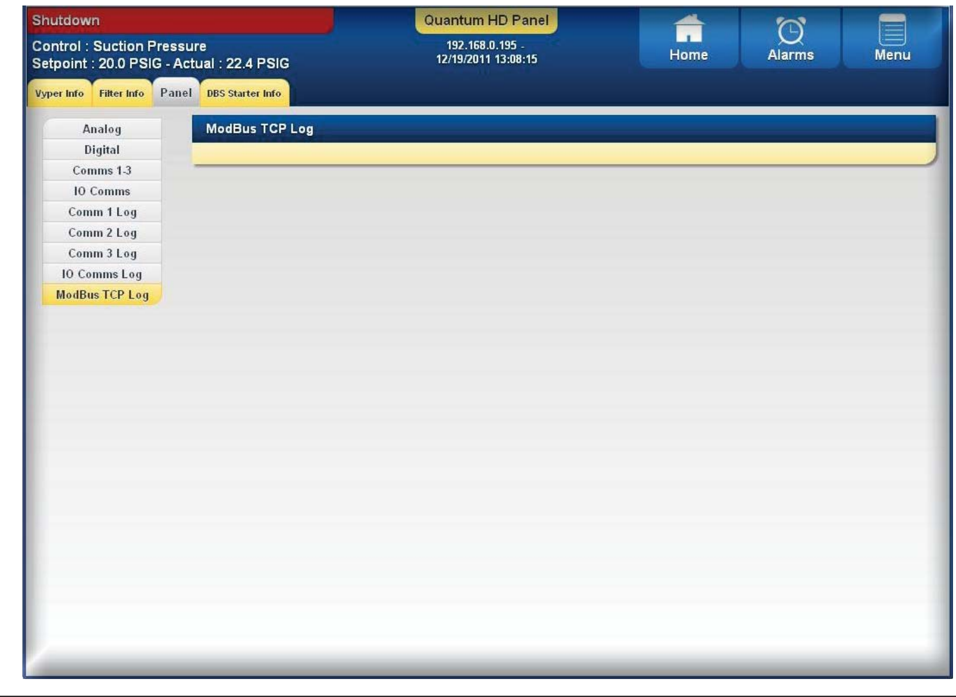
Each time a new command is sent or received, the screen will refresh automatically.

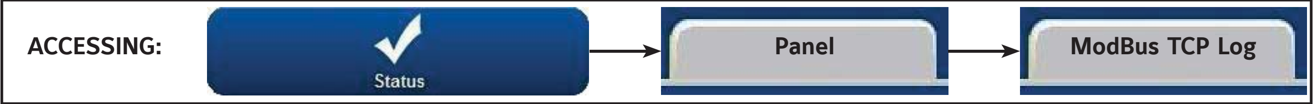
The top line of data is the most recent activity. At the left of each line, you should see whether the data is IN or OUT (Receive or Send), and the actual data (in Hexadecimal format). This information can be used to compare against the data being sent and received at the other end of the communications link, to verify proper operation.



STATUS

Panel - ModBus TCP Log



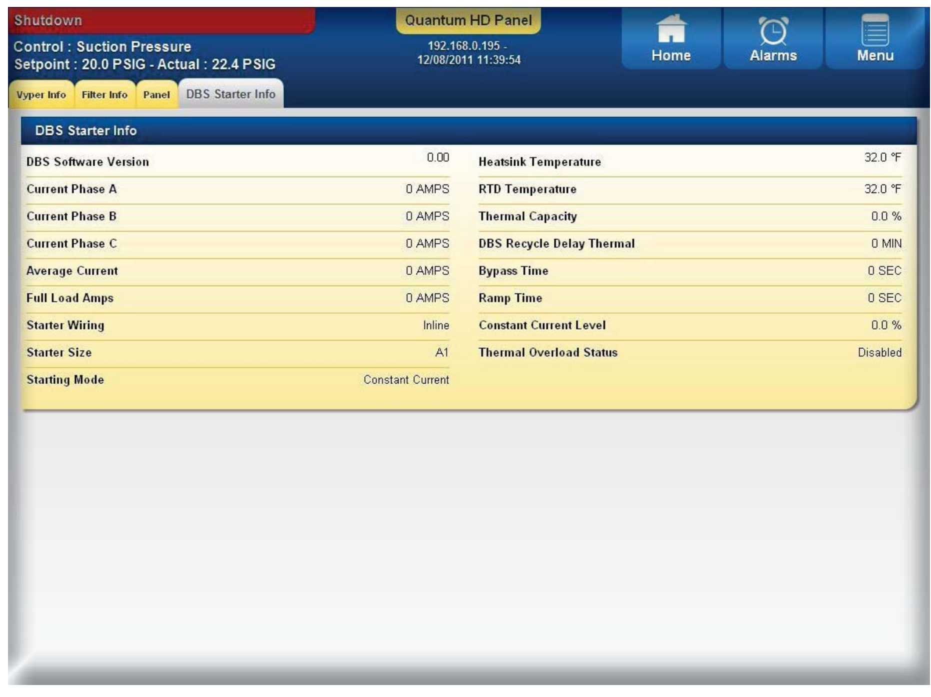


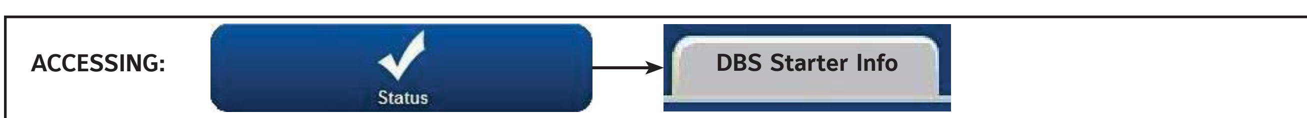
DESCRIPTION: This screen allows the technician to view the status of all ModBus TCP communications.

Refer to the Communications manual for detailed information on this screen (090.040-CS).

STATUS

DBS Starter Info





DESCRIPTION – The information shown on this screen is received directly from the DBS via communications, and represents the operational status of the DBS. These items are:

- **DBS Software Version** – If the DBS and Quantum™ HD are communicating properly, a value other than zero should be displayed here. This represents the current version of software that is running the DBS. A value of zero may indicate a communications error.
- **Current Phase (A, B, C)** – When the DBS is running, the actual current value for each of the three phases will be shown here.
- **Average Current** – This is a calculated value that represents the average current from all three phases.
- **Full Load Amps** – Motor Full Load Current (Amps) has been factory set using a switch within the DBS main control board. This switch is set based on starter size.
- **Starter Wiring** –This value is read from a switch within the DBS, and will show one of two possible types of wiring, either Delta or Inline. This is set at installation and is shown here for informational purposes only.
- **Starter Size** – This value is read from a switch within the DBS, and will show the size of the starter that is being used to control the motor. This is set at installation and is shown here for informational purposes only.
- **Starting Mode** – This value is read from a switch within the DBS, and will show whether the starter is set to run at Constant Current, or is set to Step Ramp. This is set at installation and is shown here for informational purposes only:
- **Heatsink Temperature** – This will display the value of a heatsink thermostat that is located on the DBS control board. If this thermostat opens (at 85° C), a fault will occur, and the motor will shutdown. The unit will only be able to re-start when this thermostat resets (after be allowed to cool) at 60° C.
- **RTD Temperature** – An RTD (resistive) temperature sensor is located on the DBS starter. This value is compared against the RTD Temperature Warning Level and RTD Temperature Trip Level setpoints and if the value shown exceeds either of these setpoints, either a warning or a trip will occur.
- **Thermal Capacity** – The allowable amount of thermal energy that can be absorbed before damage may occur to the motor. This value is based upon an internal calculation.



- **DBS Recycle Delay Timeout** – The motor has exceeded its Thermal Capacity and will not be allowed to start until enough time has elapsed to allow the motor to cool.

- **Bypass Time** – When the controller is set for Constant Current, a 10-position switch (SW3) on the main control board of the DBS, (adjustable from 3-30 seconds) sets the bypass time. The bypass time for Step Ramp mode is 5 seconds, plus Ramp time.

- **Ramp Time** – A 10-position switch (SW3), on the main control board of the DBS, is adjustable from 3-30 seconds and sets the time in seconds in which the current rises in the Step Ramp mode from its initial Current Step level to 500% FLA.

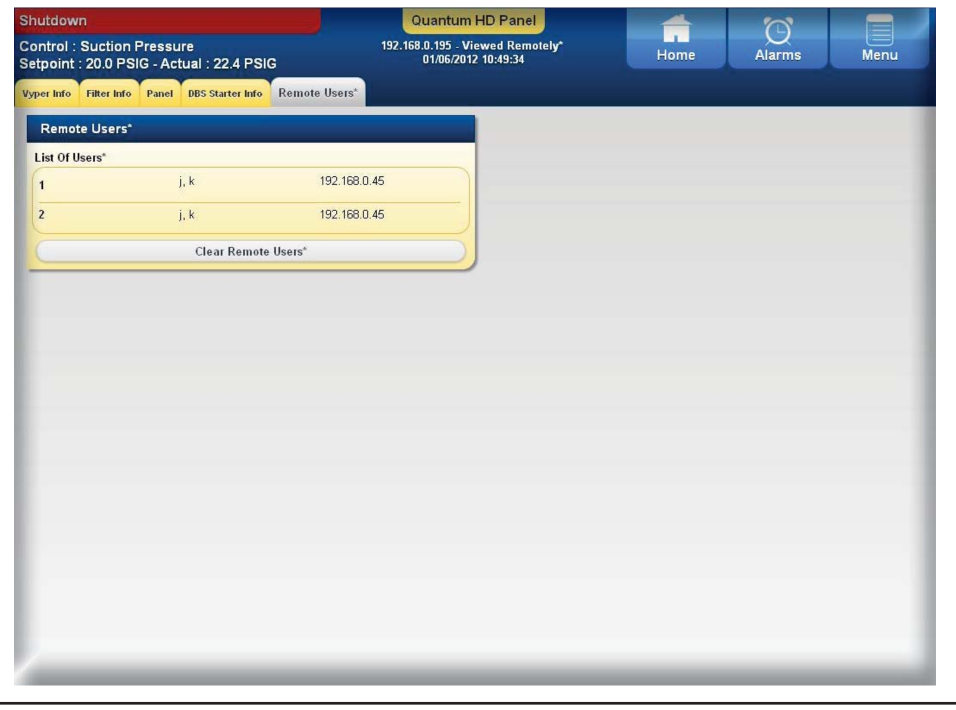
- **Constant Current Level** – A 10-position switch (SW2), located on the main control board of the DBS, sets the initial current step of the controller in either Constant Current or Step Ramp mode. This switch is adjustable from 200-425% FLA for smooth acceleration. When the controller is set for Constant Current, this switch sets the maximum current limit for the motor in this mode of operation. This current is maintained until the motor reaches full speed. When the controller is set for Step Ramp, this switch sets the initial current limit, and then allows the controller to continue its ramp to 500% FLA.

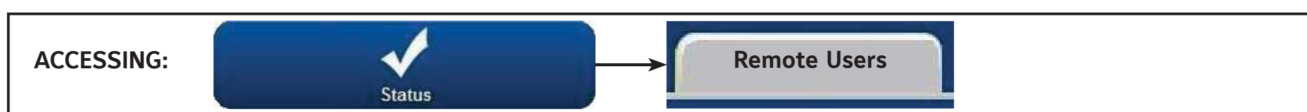
- **Thermal Overload Status** – If this feature has been enabled, then a trip will occur if the thermal energy stored in the motor exceeds 100% of motor Thermal Capacity. The estimated temperature of the motor windings is calculated based on the highest phase current. The overload trip level is computed based on the following setpoints: Full Load Amps, Locked Rotor Current, Stall Time, and Service Factor. A start will not be allowed until the motor has sufficiently cooled.

NOTE: Contact Schneider Electric at 800-220-8697 with any further questions concerning the setup and operation of the RAM DBS.

STATUS

Remote Users

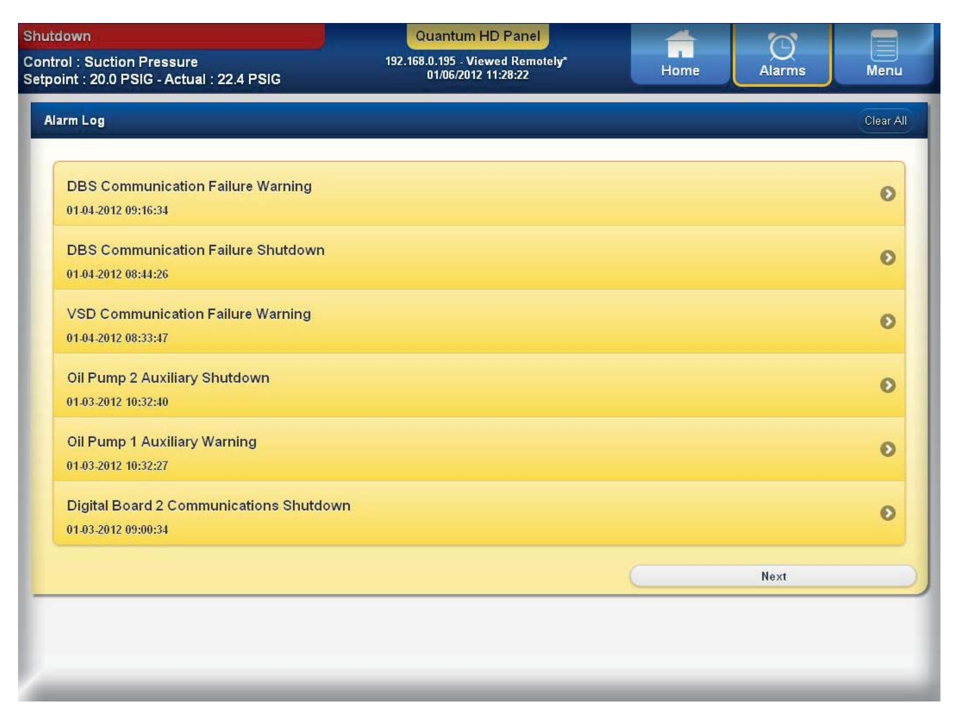




DESCRIPTION – This screen provides a list of all users currently viewing the panel remotely, along with the IP address of the computer or service that they are using.



ALARMS



ACCESSING: Alarms

DESCRIPTION – This screen shows the Warnings and Shutdowns that have recently occurred. When a warning or shutdown is triggered, a blue descriptive message shows on this screen. The date and time of the warning or shutdown occurrence is shown below the message. The most recent message will appear on the top line of the screen with the oldest appearing at the bottom.

The following selections appear on this scree:

Clear - Selecting this button will clear all warnings and/or shutdowns from this screen.

Next - If there are more than one page of alarms, this button will appear at the bottom right side of each page that has a page to follow.

Previous - If there are more than one page of alarms, this button will appear at the bottom left side of each page that has a page before it.

Selecting a message will cause the following informational box to appear:

Freeze Screen

This screen provides a snapshot of the values that were current at the time of the latest shutdown. The information on the Freeze screen can help the user to identify the cause of a fault, which occurred when no one was present. The Freeze screen freezes the information of the Operating Status screen AT THE MOMENT OF A COMPRESSOR WARNING OR SHUTDOWN.

Freeze Screen

Compressor Data

Capacity Slide	0.0 %	Auxiliary Analog 1	30.0 Hg	Auxiliary Analog 2	30.0 Hg	Auxiliary Analog 3	30.0 Hg
Auxiliary Analog 4	30.0 Hg	Auxiliary Analog 5	30.0 Hg	Auxiliary Analog 6	30.0 Hg	Auxiliary Analog 7	30.0 Hg
Auxiliary Analog 8	30.0 Hg	Auxiliary Analog 9	30.0 Hg	Auxiliary Analog 10	30.0 Hg	Analog Output 1	0.0 %
Drive Output	0.0 %	Condenser Step #1	0.0 %	Condenser Step #2	0.0 %	EZ Cool LIOC Output	0.0 %

Package Modes

Compressor	Manual	Capacity Slide	Automatic	Volume Slide	Automatic	Capacity Mode	Mode 2
Setpoint	40.0 F						

Close Window

CLEAN SCREEN MODE



ACCESSING: 

DESCRIPTION: Accessing this screen allows the user to clean the screen. When accessed, the screen touch feature is de-activated, allowing the screen to be touched in any area. Use of a pre-packaged lens or screen cleaning wipe containing isopropyl alcohol, or a spray aerosol such as Spartan Glass Cleaner. This product quickly emulsifies and suspends surface soils and smoke film for easy removal without streaking. The formula incorporates isopropyl alcohol to provide rapid drying and excellent film-free characteristics. Once the screen has been sprayed, simply wipe off the liquid with a clean, soft micro-fiber or cotton cloth.

When finished, press any of the physical keypad buttons to return to the Home screen, or simply allow the Screen Clean Mode to time out and return to the Home screen..



CONTROL SETPOINTS

Capacity Control



ACCESSING: Control Setpoints → Capacity Control → Capacity 1

DESCRIPTION: The Capacity 1 -4 screens are identical in appearance. All setpoints having to do with Capacity Control, Autocycle, Mode Safeties and Low Suction are found here.

Capacity Control is setup by accessing the Configuration > Capacity Control screen. From that screen, the user can enable or disable any of the four possible modes, as well as select the channel that they wish to control from, and select whether the control will be Forward or Reverse acting.

CAPACITY 1 (2, 3, 4)

The Capacity Control screen shown above displays four window areas of information:

Setpoint - This setpoint is used to control the loading and unloading of the compressor when the Capacity Control is in the AUTO (Automatic) or in REM SEQ (Remote Sequencing) modes.

Proportional Band High - A band, measured in the units of the Capacity Control setpoint, above the Dead Band High, where proportional load or unload control is used. If the actual reading rises into this proportional band the load or unload output will be pulsed as explained below in the description about proportional band.

Proportional Band Low - A band, measured in the units of the Capacity Control setpoint, below the Dead Band Low, where proportional load or unload control is used. If the actual reading falls into this proportional band the load or unload output will be pulsed as explained below in the description about proportional band.

Description Of Proportional Band Control: The Proportional Band setpoint determines a range of Capacity Control values where pulsed output control is used. Outside of the proportional band the output is continuously energized. The length of time the output will be pulsed on is proportional to the distance the actual reading is from the Capacity Control setpoint. The further the distance from setpoint, the longer the output is pulsed on and the shorter the output is off. The closer the distance to setpoint, the shorter the output is pulsed on and the longer the output is off. If the actual reading is midpoint from setpoint, the output is on and off an equal amount of time.

Dead Band High - A band, measured in the units of the Capacity Control setpoint, above the setpoint at which the compressor will neither load nor unload.

Dead Band Low - A band, measured in the units of the Capacity Control setpoint, below the setpoint at which the compressor will neither load nor unload.

Cycle Time High - This setpoint determines the amount of time in seconds that the load or unload output is on and off, when in the upper proportional band. Refer to the description below about cycle time.

Cycle Time Low - This setpoint determines the amount of time in seconds that the load or unload output is on and off, when in the lower proportional band. Refer to the description below about cycle time.

Description Of Cycle Time: The Cycle Time setpoint determines the total amount of time for one on/off cycle, when in the proportional band. At the completion of the cycle time the actual reading and necessary response is re-evaluated. If a four second period is selected, then the following will result:

Proportional Distance (Actual Reading is From Setpoint)	Output Pulsed On (seconds)	Output Off (seconds)
0	0	4
1/4	1	3
1/2	2	2
3/4	3	1
1	4	0

If a variable speed drive is used, the VSD Proportional Band and Intergrated Time setpoints will be preset

[Proportional Band] – This setpoint determines the size of a region either above or below the Control Setpoint. Within this region, the Proportional component of the PI Output value is the number between 0% and 100% that directly corresponds to the difference between the Control Input (Actual) and the Control Setpoint (Setpoint). Outside of this region, the Proportional component is either 100% or 0%. If the PI's Action is Forward, the Proportional Band extends above the Control Setpoint. If the PI's Action is Reverse, the Proportional Band extends below the Control Setpoint.

[Integration Time] - This setpoint controls the influence that the Integral component exerts on the PI Output value. The Integral component works to push the Control Input toward the Control Setpoint by tracking the difference between the Control Input and the Control Setpoint over time.

AUTOCYCLE - The following setpoint boxes are provided:

Start - The compressor turns on when the value of the capacity control input reaches this setpoint. This setpoint is used in both AUTO (Automatic) or in REM SEQ (Remote Sequencing) modes.

Start Delay – The time in minutes that the value of the capacity control input must be above (forward) or below (reverse) the start setpoint before the compressor will start.

Stop - The compressor is stopped when the value of the capacity control input reaches this setpoint. This setpoint is used in both AUTO (Automatic) or in REM SEQ (Remote Sequencing) modes.

Stop Delay - The time in minutes that the value of the capacity control input must be below (forward) or above (reverse) the stop setpoint before the compressor will stop.

MODE SAFETIES

Load Inhibit - This setpoint prevents the compressor from loading.

Force Unload - This setpoint will actively decrease the capacity of the compressor to avoid reaching the warning and shutdown setpoints.

Warning - If the Capacity Control value is less than (forward) or greater than (reverse) this setpoint for the Warning Delay, a warning occurs.

Shutdown - If the Capacity Control value is less than (forward) or greater than (reverse) this setpoint for the Shutdown Delay, a shutdown occurs.

LOW SUCTION - The following setpoint boxes are provided (NOTE: This box will be empty if Suction Pressure has been selected as the Mode control channel):

Load Inhibit – As the suction pressure drops below this setpoint, the compressor is prevented from loading.

Force Unload – When the suction pressure reaches this setpoint, the capacity of the compressor will be decreased to avoid reaching the low warning and shutdown setpoints.

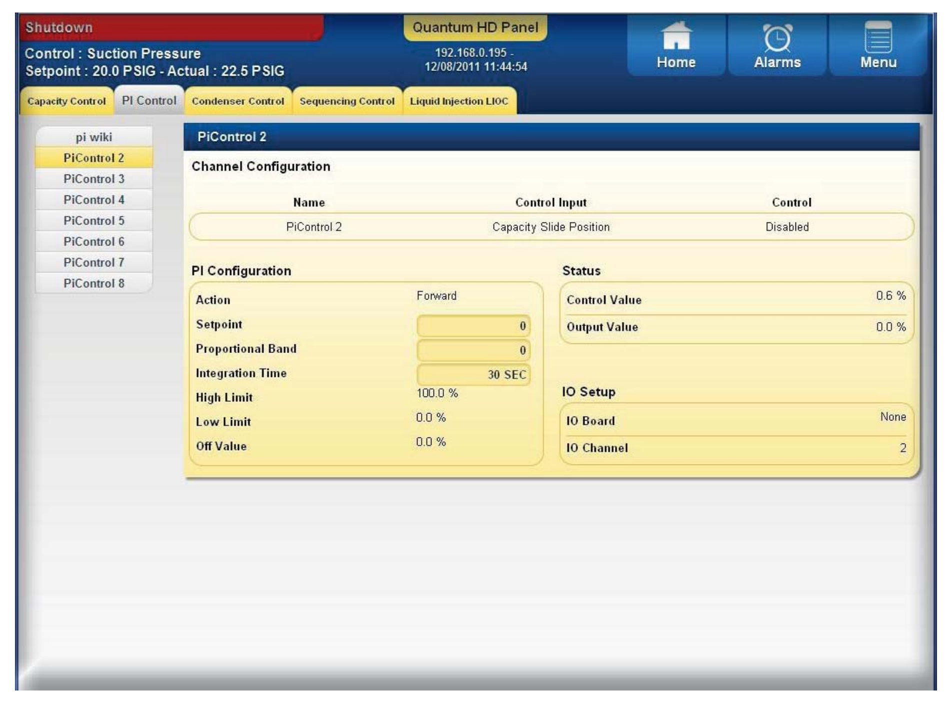
Warning - If the Suction Pressure is less than this setpoint for the Warning Delay, a warning occurs.

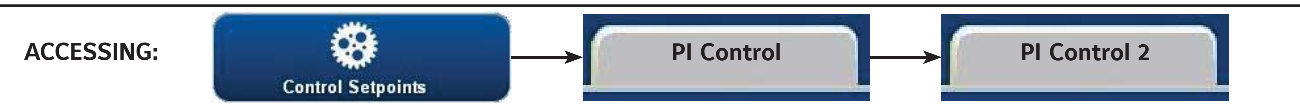
Shutdown - If the Suction Pressure is less than this setpoint for the Shutdown Delay, a shutdown occurs.



CONTROL SETPOINTS

PI Control





DESCRIPTION: This screen allows for certain specific set-points to be adjusted. The following information is shown on this screen:

CHANNEL CONFIGURATION - This information is set using the Configuration > Proportional / Integral screen.

[Name] - The name of the control channel is shown here.

[Control Input] - One of the following channels will be shown here:

- Capacity Slide Position
- Volume Slide Position
- Suction Pressure
- Discharge Pressure
- Compressor Oil Pressure
- Main Oil Injection Pressure
- Economizer Pressure
- Filter Pressure
- Intermediate Pressure
- Balance Piston Pressure
- System Discharge Pressure
- Suction Temperature
- Discharge Temperature
- Compressor Oil Temperature
- Oil Separator Temperature
- Process/Brine Temperature Leaving
- Process/Brine Temperature Entering
- Remote Control Setpoint
- Motor Current
- RPM
- Kilowatts
- User defined analog inputs #1 - #10
- EZ Cool Feedback %
- User defined analog inputs #12 - #20
- Manifold Pressure
- Remote Capacity Position
- Compressor Vibration – Suction
- Compressor Vibration – Discharge
- Motor Vibration – Shaft Side
- Motor Vibration – Opposite Shaft Side
- Motor Temperature – Shaft Side
- Motor Temperature – Opposite Shaft Side
- Motor Stator #1 - #3·

[Control] - One of the following control options will be shown:

- **Disabled** - No PID control.

- **Running** - PID Control only controls when the compressor is running.

- **Active** - PID control always active.

PI CONFIGURATION

[Action] - One of the following actions will be shown here:

- **Forward** - The output will increase at values greater than the Control Setpoint.

- **Reverse** - The output will increase at values less than the Control Setpoint.

[Setpoint] - Enter the value that you wish to control to.

[Proportional Band] – This setpoint determines the size of a region either above or below the Control Setpoint. Within this region, the Proportional component of the PI Output value is the number between 0% and 100% that directly corresponds to the difference between the Control Input (Actual) and the Control Setpoint (Setpoint). Outside of this region, the Proportional component is either 100% or 0%. If the PI's Action is Forward, the Proportional Band extends above the Control Setpoint. If the PI's Action is Reverse, the Proportional Band extends below the Control Setpoint.

[Integration Time] - This setpoint controls the influence that the Integral component exerts on the PI Output value. The Integral component works to push the Control Input toward the Control Setpoint by tracking the difference between the Control Input and the Control Setpoint over time.

[High Limit] - The highest value that the output can be is shown.

[Low Limit] - The lowest value that the output can be is shown.

[Off Value] - If the PI's Control is set to When Running, then the value shown here sets the value of the PI output when the compressor is off.

STATUS

Control Value - The Actual value of the input signal. This is not a setpoint value.

Output Value- The value of the Output signal as controlled by the PI. This is not a setpoint value.

IO SETUP

[I/O Board] - One of the following Analog Boards will be shown:

- **None**

- **Analog Board 1**

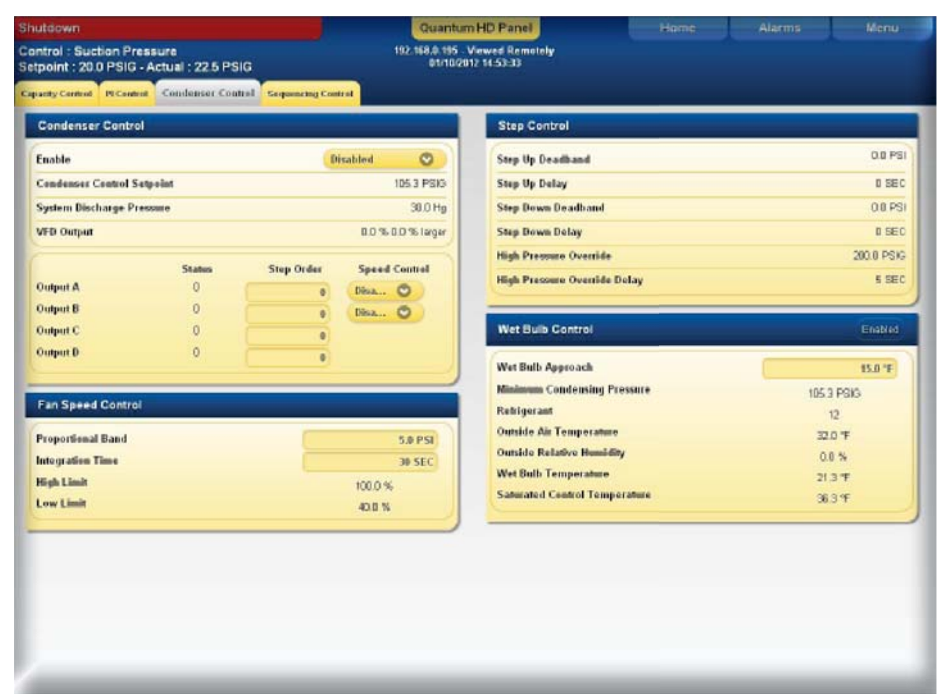
- **Analog Board 2**

[Output Channel] - The analog board output channel that will be used is shown here.



CONTROL SETPOINTS

Condenser Control





DESCRIPTION: If Condenser is enabled, this screen allows the end user to enter and view the basic operating parameters related to condenser digital operation. This information is set using the Configuration > Condenser Control screen.

The following information is shown on this screen:

CONDENSER CONTROL

Enable – Selecting this button provides the following options:

Condenser Control Setpoint – This is the value that the Condenser Control will attempt to maintain.

System Discharge Pressure – This shows the actual System Discharge Pressure.

VFD Output - This is the current VSD output as a percentage relative to the minimum and maximum VSD output settings.

[Module A - D Step Order] - The four different output modules are enabled by putting a number (1-4) into the Step Order setpoint boxes. These determine the order that the modules are turned on or off. If a Module has a 0 (zero) as its Step Order setpoint, it is disabled from the control process.

FAN SPEED CONTROL

The following setpoint boxes are provided:

Proportional Band – – The range over which the PID control will be managing the Variable Speed Fan (provided Integration Time is not set to zero, in which case it will be strictly proportional).

Integration Time - This setpoint controls the influence that the Integral component exerts on the PI Output value.

The following information is displayed

[High Limit] – The percentage of the 4-20mA signal which should be considered maximum capacity (usually 100%).

[Low Limit] - – The percentage of the 4-20mA signal which should be considered minimum capacity (usually 40%).

STEP CONTROL

[Step Up Deadband] and **[Step Up Delay]** – When the System Discharge Pressure stays above the combined values of the Condenser Control Setpoint plus the Step Up Deadband for the amount of time as set in the Step Up Delay, the next module in the Step Order will turn on.

[Step Down Deadband] and **[Step Down Delay]** – When the System Discharge Pressure stays below the difference of the values for Condenser Control Setpoint minus the Step Down Deadband for the amount of time as set in the Step Up Delay, the next module in the Step Order will turn off.

[High Pressure Override] and **[High Pressure Override Delay]** - When the System Discharge Pressure goes and stays at or above the High Pressure Override value for the amount of time as set in the High Pressure Override Delay, all modules will turn on.

WET BULB CONTROL

The Quantum™ HD control panel provides a Wet Bulb control strategy which has the ability to run a condenser based on current atmospheric conditions by sensing the outdoor air temperature and humidity. This technique, also referred to as floating head pressure, provides the ability to run a refrigeration system at the lowest permissible head pressure. Traditional condenser control uses a fixed head pressure that does not change with weather conditions or system load. However studies have found that allowing the condenser/head pressure to float will result in energy savings. These savings result from the compressor not working as hard. While the condenser may use more energy to achieve a lower head pressure, the reduction in energy consumption by the compressor is significantly greater, providing an overall savings.

The Wet Bulb control utilizes a humidity sensor along with a standard (dry bulb) temperature sensor. These values are combined to produce a Wet Bulb temperature. The Wet Bulb Approach temperature is then added to the calculated Wet Bulb temperature. The Approach temperature sets how close the condenser will run to the Web Bulb temperature and will be determined by the condenser and system design. Finally, the Control temperature (which is the sum of the Wet Bulb Temperature and the Approach Temperature) is converted to the saturated vapor pressure which in turn becomes the condenser control pressure. A minimum condensing pressure setpoint specifies the lowest permissible condenser control pressure.

The following selections are provided:

- **Disabled** - The Wet Bulb feature is ignored.
- **Enabled** - The Wet Bulb feature will be utilized.

The following setpoint is available (if Wet Bulb is enabled):

[Wet Bulb Approach] - This is a value to be entered by the facilities refrigeration engineer, which will be added to the Wet Bulb Temperature to determine the Control Temperature.

The following information is provided (if Wet Bulb is enabled):

Minimum Condensing Pressure - This value specifies the lowest condenser control pressure that is permitted while the wet bulb control strategy is in use.

Refrigerant - The type of refrigerant being used is shown.

Outside Air Temperature - The actual outside air temperature is shown.

Outside Relative Humidity - The actual outside relative humidity is shown.

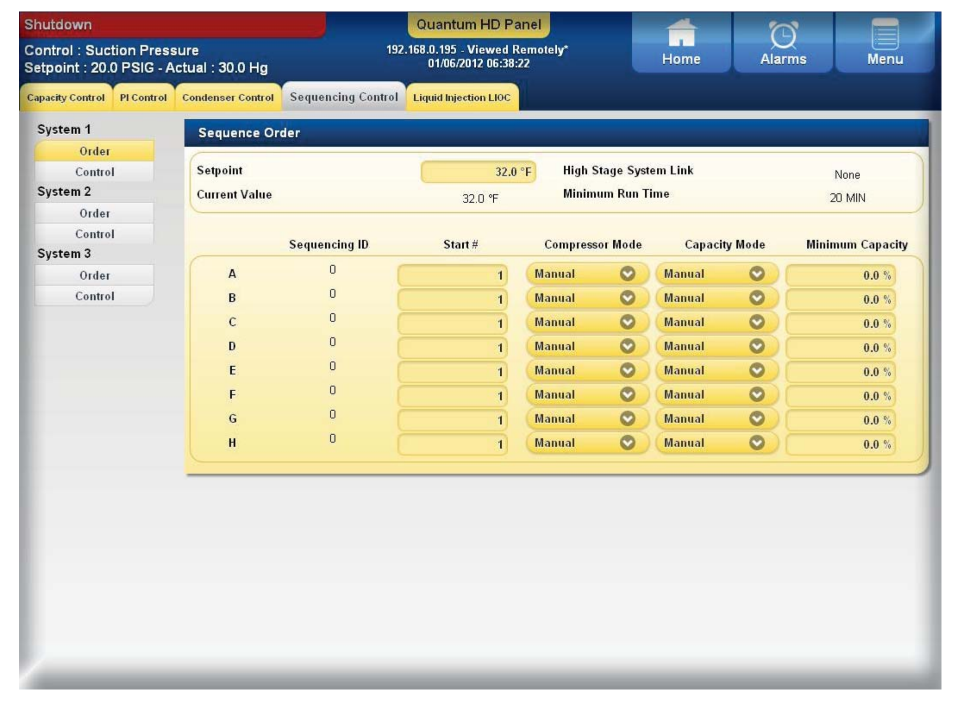
Wetbulb Temperature - The value shown here is the calculation of Outside Air Temperature and Outside Relative Humidity to arrive at a Wet Bulb Temperature.

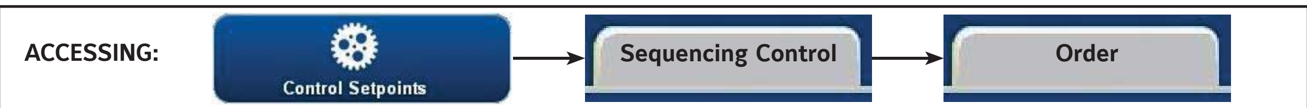
Saturated Control Temperature - This is the calculated control Saturated Condensing Temperature. This value is converted to the associated pressure which serves as the control pressure setpoint.



CONTROL SETPOINTS

Sequencing Control - Order





DESCRIPTION: This screen is used to set Sequencing order, and will be available if Sequencing is enabled in Compressor configuration.

The following pull-down menus and setpoint boxes are shown here:

SEQUENCING ORDER

Setpoint - Use this setpoint box to set the value that you wish all compressors within this System to maintain.

Current Value - This is the actual value for the capacity control (as measured from the Master compressor). It is to this value that the compressors will attempt to maintain. This is strictly a displayed value, and cannot be changed here.

High Stage System Link - The High Stage System Link setpoint is provided to tie a system of Booster compressors to a system of High Stage compressors. This is strictly a displayed value, and cannot be changed here.

Minimum Run Time - This is the minimum amount of time that each compressor within this system will run, when called upon to do so. This is strictly a displayed value, and cannot be changed here.

There are eight rows of setpoint boxes shown at the bottom of this screen. These rows correspond to up to eight different compressors, which combined will make up this system. The user may program as few or as many of these rows as their situation requires:

Sequencing ID - Enter the last octet of the IP Address here. This will identify each of the possible eight compressors to the Master. A row with a 0 (zero) as the sequencing ID will be ignored. The lowest number will identify which compressor is to be the Master. If the Master is for some reason turned off, the next lowest numbered compressor will become the Master, and so on.

Start # - The allowable numbers here are 0 – 8. This number determines which compressor to start or stop next, based upon capacity need (see pages 13 – 14). Entering a 0 (zero) in this field will exclude the compressor from starting consideration.

Compressor Mode -

- Manual
- Automatic
- Remote Comm
- Remote IO
- Remote Seq.

Capacity Mode -

- Manual
- Automatic
- Remote Comm

- Remote 4-20
- Remote IO
- Remote Seq.

Minimum Capacity - This is the capacity that a compressor will load to when it is started. It will remain at or above this capacity until it is commanded to stop.

NOTE: The Compressor Mode and Capacity Mode listed above should both be set to Remote Seq. for complete execution of the sequencing system by the master to occur.

The following is a description of the Sequencing strategy:

Start/Stop

System Setup:

- Control Input – Suction Pressure
- Control Direction – Forward
- High Stage Link – Disabled

Start Procedure

Before starting a compressor, the master must determine that all running compressors are loaded and that the Suction Pressure has risen to a point where an additional compressor is needed.

First, the master checks that either no compressors are running or all the running compressors average 90% capacity. If a running compressor is at less than 90% capacity but is in a Load Inhibit or Force Unload condition, for the purposes of this calculation it is assumed to be at 90% capacity.

If all the running compressors are loaded the master next begins comparing its Suction Pressure to the Autocycle Start setpoint. When the Suction Pressure rises above the Start setpoint, the start timer is initiated. If the start timer reaches the Autocycle Start Delay setpoint time and the Suction Pressure has remained above the Start setpoint for the entire time, the master attempts to start an additional compressor. If the Autocycle Start Delay setpoint is 0 minutes, the master still waits 15 seconds before starting a compressor.

To determine which compressor to start, the master first sorts all the compressors in the system based on their start number, low to high. If two compressors have the same start number, the first one on the list remains ahead of the second. Next, the master starts at the top of the list and works down through list until it finds a compressor that is available to run. To be deemed available, a compressor must have good sequencing communications and its Compressor Mode and Capacity Mode must be set as Remote Sequencing. In addition the compressor must be off, and it cannot be in a Start Inhibit condition except for the Start Inhibit Slide Value Too High condition. The compressor with the lowest start number that also meets these conditions is then sent a start command. If no compressors are currently available to start, the master will continue checking until one becomes available or until the Suction Pressure drops below the Start setpoint.

After a compressor has been sent a start command, the master waits for that compressor to reach a Running state. If 3 minutes passes and the compressor has not yet begun to run, the master sends it a stop command. This compressor is then flagged as Unable to Start for 1 hour. After that time the master may again try to restart the compressor if additional capacity is needed. After a compressor begins running, or after one fails to start and is sent a stop command, the master can begin the process of starting another compressor.

Stop Procedure

If the Suction Pressure drops to a point where one of the running compressors is no longer needed, the master will stop the last compressor in the sequence list.

When the Suction Pressure drops below the Autocycle Stop setpoint, the stop timer is initiated. If the stop timer reaches the Autocycle Stop Delay setpoint time and the Suction Pressure has remained below the Stop setpoint for the entire time, the master attempts to stop one of the running compressors. If the Autocycle Stop Delay setpoint is 0 minutes, the master still waits 15 seconds before stopping a compressor.

To select the compressor to stop, the master also sorts all the compressors in the system according to their start number. Then the master starts at the bottom of the list and works up, looking for a running compressor that can be stopped. To be selected a compressor must have good sequencing communications and its Compressor Mode and Capacity Mode must be set as Remote Sequencing. In addition, the compressor's run time must be greater than the compressor's Minimum Run Time setpoint. If the Minimum Run Time setpoint is 0 minutes, a compressor can also be stopped if it is still in Starting mode. The compressor with the highest start number that meets these conditions is sent a stop command. If no compressors are currently available to stop, the master will continue checking until one becomes available or until the Suction Pressure rises above the Stop setpoint.

After a compressor has been sent a stop command, the master waits for that compressor to go to off. If 3 minutes passes and the compressor has not yet turned off, the master then flags this compressor as Unable to Stop for 1 hour. After that time the master may again try to stop the compressor. After a compressor goes to off or after one fails to stop within 3 minutes, the master can begin the process of stopping another compressor.



Load/Unload

System Setup:

- Control Input – Suction Pressure
- Control Direction – Forward
- High Stage Link – Disabled

Load Procedure

If the master compressor's Suction Pressure is above the Capacity Control setpoint, the master calculates the increase in capacity that is required. The calculation is as follows:

Difference = Suction Pressure – (Capacity Control Setpoint + Upper Dead Band)

If the Difference is less than the Upper Proportional Band:

Capacity Change = (Difference / Upper Proportional Band) * Upper Cycle Time

If the Difference is greater than the Upper Proportional Band:

Capacity Change = Upper Cycle Time

After the capacity increase has been calculated, the master then finds the compressor whose capacity should be changed. To make this determination, the master sorts all the compressors based on their start number. Beginning at the compressor with the lowest start number, the master finds the first compressor on the list that is running but is not at its maximum capacity. A compressor is at maximum capacity if it is at 100 percent capacity or if it is in a Load Inhibit or Force Unload condition.

If the selected compressor is running the Quantum™ HD software, the capacity increase is added to the compressor's current capacity. This new value is then sent to the compressor as its Capacity Command, and that compressor will try to increase its capacity to match the Command value.

If the selected compressor is controlled by a Quantum™ 1-4 or a Plus panel, the capacity increase is interpreted as the time period for a load pulse and is sent to the compressor as a load command. The slave compressor will then turn on its load output for the given number of seconds.

Unload Procedure

If the master compressor's Suction Pressure is below the Capacity Control setpoint, the master calculates the decrease in capacity that is required. The calculation is as follows:

Difference = (Capacity Control Setpoint - Upper Dead Band) – Suction Pressure

If the Difference is less than the Lower Proportional Band:

Capacity Change = (Difference / Lower Proportional Band) * Lower Cycle Time

If the Difference is greater than the Lower Proportional Band:

Capacity Change = Lower Cycle Time

After the capacity decrease has been calculated, the master then finds the compressor whose capacity should be changed. To make this determination, the master sorts all the compressors based on their start number. Beginning at the compressor with the highest start number, the master finds the last compressor on the list that is running and whose capacity is above its Minimum Capacity setpoint. If two compressors are currently running at or below their Minimum Capacity setpoints, the master will not allow any additional compressors to unload. This will allow the Suction Pressure to continue to drop and will cause the master to turn off one of the unloaded compressors. If the master sees that only one compressor is running in its system, it will continue to unload the compressor down to the master's Automatic Capacity Mode Minimum Slide Valve Position setpoint.

If the selected compressor is running the Quantum™ HD software, the capacity decrease is subtracted from the compressor's current capacity. This new value is then sent to the compressor as its Capacity Command, and that compressor will try to decrease its capacity to match the Command value.

If the selected compressor is controlled by a Quantum™ 1-4 or a Plus panel, the capacity decrease is interpreted as the time-period for an unload pulse and is sent to the compressor as an unload command. The slave compressor will then turn on its unload output for the given number of seconds.

High Stage/Booster

The High Stage System Link setpoint is provided to tie a system of Booster compressors to a system of High Stage compressors. For example, if the Booster compressors are setup on System #1 and the High Stage Compressors are on System #2, the High Stage System Link setpoint from System #1 would be set as System 2.

When the Booster System's master wants to start the first Booster compressor, it first checks that a Booster compressor is available to run and then sends a signal to the High Stage System's master telling it to start a High Stage compressor. If all the High Stage compressors are off, the High Stage System's master will start its first compressor, regardless of what the High Stage Control Input is reading. When the Booster System's master observes that a High Stage compressor is running, it will allow a Booster compressor to start.

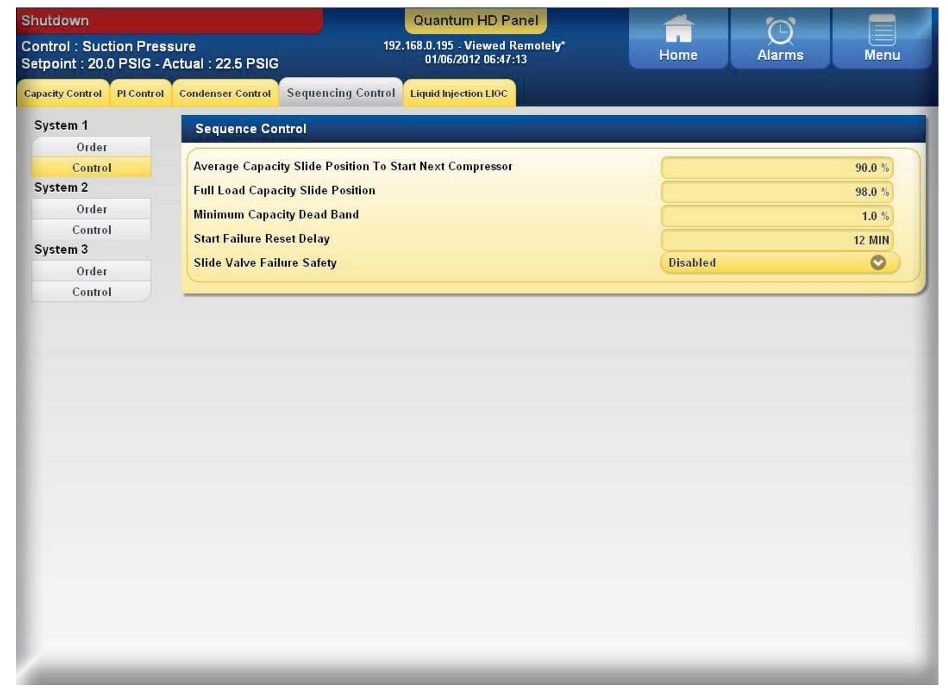
After the first High Stage compressor begins to run, compressors in both systems will cycle on and off as their Control Inputs move up and down. The only stipulation to the control strategy is that one High Stage compressor must always remain on as long as at least one Booster compressor is running. If all the Booster compressors turn off, the High Stage compressor can then turn off as well.

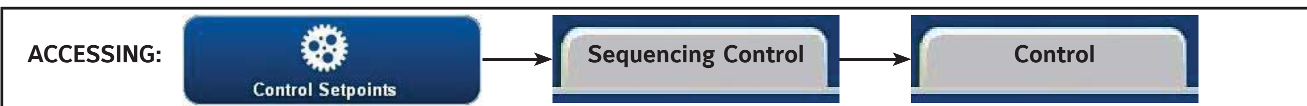
This concludes the Sequencing setup.



CONTROL SETPOINTS

Sequencing Control - Control





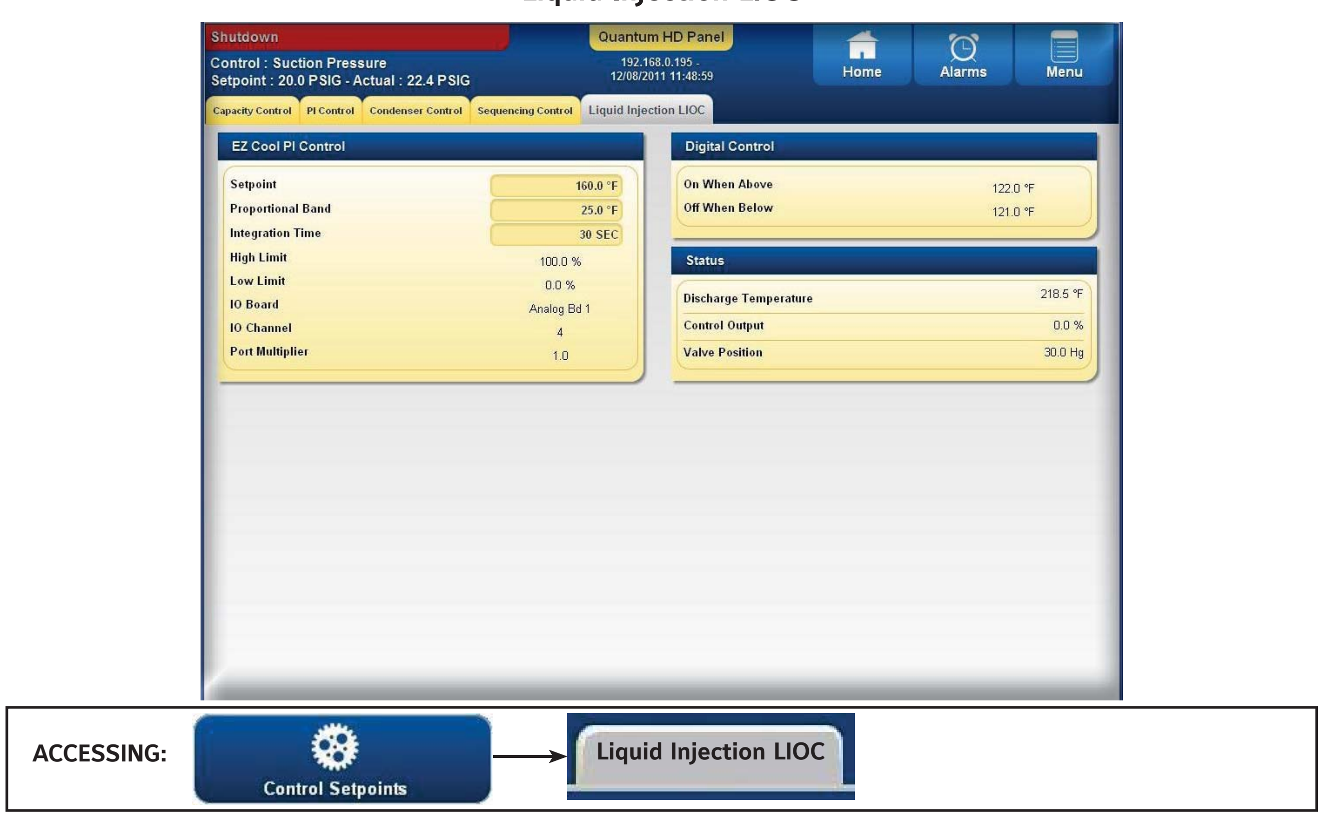
DESCRIPTION: This screen is used to set Sequencing control, and will be available if Sequencing is enabled in Compressor configuration.

The following setpoint boxes appear on this screen:

- **Average Capacity Slide Position to Start Next Compressor** - If more than one compressor is running and the Average Capacity is greater than this setting, the next compressor in line can be started, if needed.
- **Full Load Capacity Slide Position** - This setpoint represents the Capacity Slide Valve Position at which this machine will be considered at full load capacity.
- **Full Load Drive Speed Position** - This is the speed value at which the compressor will be considered at full capacity by speed.
- **Minimum Capacity Dead Band** - This is the dead band above and below the Minimum Capacity % setpoints that the controller will load or unload. If the Minimum Capacity % is 40% and the dead band is 1%, the controller will unload above 41% and load below 39% Capacity Slide.
- **Start Failure Reset Delay** - This is the time that needs to pass after a sequencing start fails before the compressor is available to be back in the sequence operation.
- **Slide Valve Failure Delay** - If the compressor is unavailable to start based upon the Capacity Slide Position, the sequencing will move on to the next compressor in order.

CONTROL SETPOINTS

Liquid Injection LIOC



DESCRIPTION: This screen allows the user to enter and view the basic operating parameters related to EZ Cool LIOC PI control.

The following are the EZ Cool LIOC Setup screen selections available on this screen:

EZ COOL PI CONTROL

[Setpoint] - Enter the value that you wish to control to.

[Proportional Band] – This setpoint determines the size of a region either above or below the Control Setpoint. Within this region, the Proportional component of the PI Output value is the number between 0% and 100% that directly corresponds to the difference between the Control Input (Actual) and the Control Setpoint. Outside of this region, the Proportional component is either 100% or 0%. If the PI's Action is Forward, the Proportional Band extends above the Control Setpoint. If the PID's Action is Reverse, the Proportional Band extends below the Control Setpoint.

[Integration Time] - This setpoint controls the influence that the Integral component exerts on the PI Output value. The Integral component works to push the Control Input toward the Control Setpoint by tracking the difference between the Control Input and the Control Setpoint over time.

High Limit - The highest value that the output can be.

Low Limit - The lowest value that the output can be.

I/O Board - One of the following will be shown:

- **None**
- **Analog Board 1**
- **Analog Board 2**

I/O Channel - The output channel that will be used will be shown.

Port Multiplier - The standard value is 1 (one).

DIGITAL CONTROL

An output is provided for an optional Liquid Injection solenoid valve. The function of this output is only available if the compressor has Liquid Injection oil cooling and it has been enabled. Liquid Injection controls the supply of liquid refrigerant to the compressor. Liquid Injection is off (the solenoid is closed) if the compressor is off.

[On When Above] - When the Discharge Temperature is above this setpoint, the Liquid Injection solenoid output will energize, until the Dis-



charge Temperature drops below this setpoint.

[Off When Below] - When the Discharge Temperature is below this setpoint, the Liquid Injection solenoid output will de-energize, until the Discharge Temperature raises above this setpoint.

STATUS

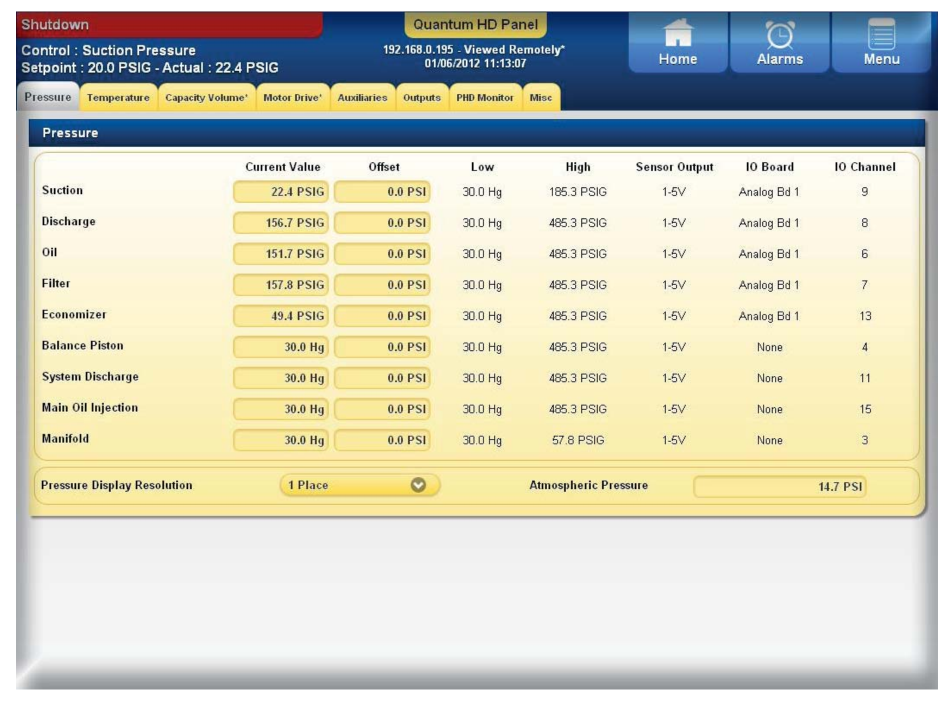
Discharge Temperature - The actual Discharge temperature is shown here.

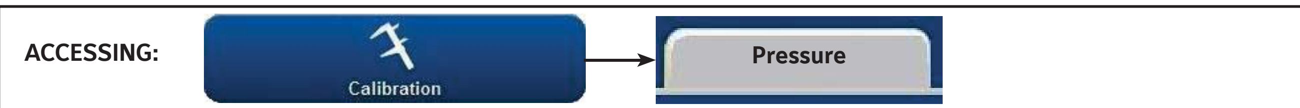
Control Output - The value of the Output signal as controlled by the PI. This is not a setpoint value.

Valve Position - The value shown here represents the position of the valve with relationship to the Control Output.

CALIBRATION

Pressure





DESCRIPTION: This screen is used to view and set the pressure calibration values.

This screen should be used anytime a pressure sensor is found to be out of calibration. The recommended practice for adjusting the calibration reading is to first determine which sensor(s) need to be calibrated. Once this is determined, you must know the actual reading that should be showing. This can be accomplished by comparing the Current Value shown, with the actual value using a separate measurement device, such as a Digital Volt Meter, or temperature probe, etc. Determine the difference between what the Current Value for the sensor is, and what the reading of the separate device shows. As an example, assume that the Suction Pressure on this screen reads 135 PSIG, but a separate device shows a reading of 142 PSIG. Select either the Current Value box and enter 142 there, or enter the difference between the Current Value and the actual reading (7) into the Offset box. The new reading will now be 142, and should match your separate reading.

PRESSURE

Sensors - The following sensor values are displayed along with the unit of measure at the left side of the screen:

Suction
Discharge
Oil
Filter
Economizer
Balance Piston
System Discharge
Main Oil Injection
Manifold

[Current Value] - This box will initially show the actual value being read by a sensor. It is also a setpoint box that allows the user to set the current value that is being read by the sensor to a different value, in the case that the calibration is inaccurate, this new value will be added to the actual value to update the offset (see below).

[Offset] - A value entered here will allow the user to compensate for calibration issues with a sensor. This value is then added to the Current Value, to create a new Current Value (see above).

Low - This will show the low end range that the sensor is capable of reading.

High - This will show the high end range that the sensor is capable of reading.

Sensor Output - This will show the current type of sensor that is being used.

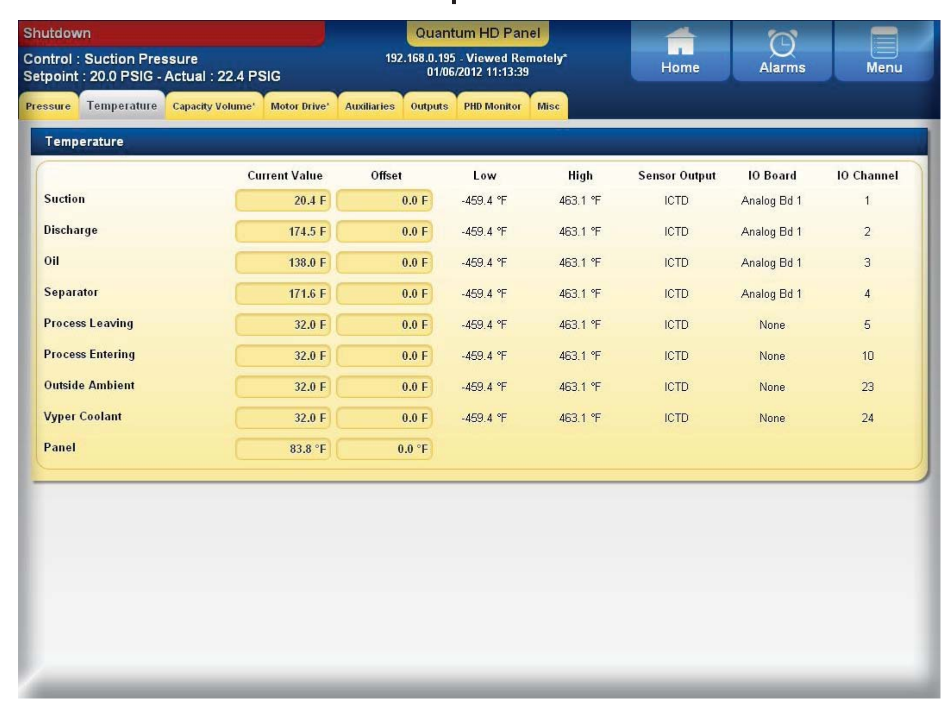
I/O Board - This will show the current I/O board that the sensor is assigned to.

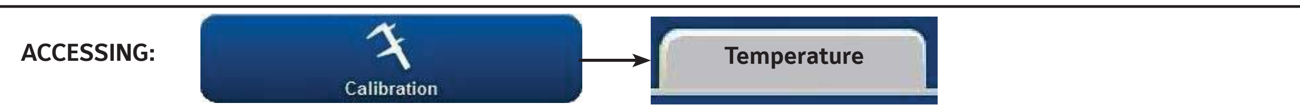
I/O Channel - This will show the current I/O channel that the sensor is assigned to.



CALIBRATION

Temperature





DESCRIPTION: This screen is used to view and set the temperature calibration values.

This screen should be used anytime a temperature sensor is found to be out of calibration. The recommended practice for adjusting the calibration reading is to first determine which sensor(s) need to be calibrated. Once this is determined, you must know the actual reading that should be showing. This can be accomplished by comparing the Current Value shown, with the actual value using a separate measurement device, such as a Digital Volt Meter, or temperature probe, etc. Determine the difference between what the Current Value for the sensor is, and what the reading of the separate device shows. As an example, assume that the Suction Temperature on this screen reads 120° F, but a separate device shows a reading of 123° F. Select either the Current Value box and enter 123 there, or enter the difference between the Current Value and the actual reading (3) into the Offset box. The new reading will now be 123, and should match your separate reading.

The following fields are provided:

TEMPERATURE

Sensors - The following sensor values are displayed along with the unit of measure at the left side of the screen:

- **Suction**
- **Discharge**
- **Oil**
- **Separator**
- **Process Leaving**
- **Process Entering**
- **Outside Ambient**
- **Vyper Coolant**
- **Panel**

[Current Value] - This box will initially show the actual value being read by a sensor. It is also a setpoint box that allows the user to set the current value that is being read by the sensor to a different value, in the case that the calibration is inaccurate, this new value will be added to the actual value to update the offset (see below).

[Offset] - A value entered here will allow the user to compensate for calibration issues with a sensor. This value is then added to the Current Value, to create a new Current Value (see above).

Low - This will show the low end range that the sensor is capable of reading.

High - This will show the high end range that the sensor is capable of reading.

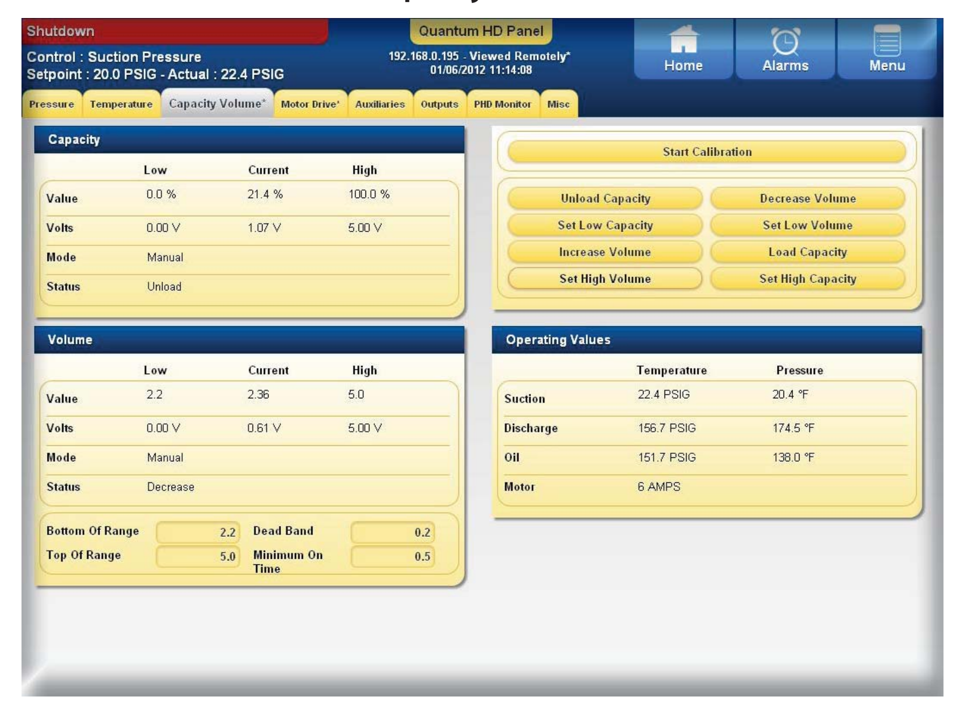
Sensor Output - This will show the current type of sensor that is being used.

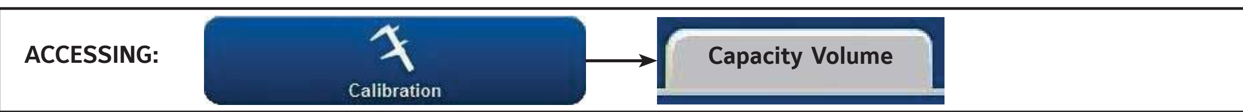
I/O Board - This will show the current I/O board that the sensor is assigned to.

I/O Channel - This will show the current I/O channel that the sensor is assigned to.

CALIBRATION

Capacity Volume





DESCRIPTION: This screen is used to view and set the capacity and volume calibration values.

The following information is provided:

CAPACITY

Value - The following three values are shown:

- **Low** - The Low end percentage of range.
- **Current** - The Current percentage.
- **High** - The High end percentage of range.

Volts - The following three values are shown:

- **Low** - The Low end actual voltage of the output.
- **Current** - The Current voltage of the output.
- **High** - The High end actual voltage of the output.

Mode - One of the following Mode states will be shown:

- **Manual**
- **Automatic**
- **Remote Comm**
- **Remote IO**
- **Remote 4-20 Input**
- **Remote Seq**

Status - One of the following Mode statuses will be shown:

- **Idle**
- **Load**
- **Unload**

VOLUME

Value - The following three values are shown:

- **Low** - The Low end percentage of range.
- **Current** - The Current percentage.
- **High** - The High end percentage of range.

Volts - The following three values are shown:

- **Low** - The Low end actual voltage of the output.
- **Current** - The Current voltage of the output.
- **High** - The High end actual voltage of the output.

Mode - One of the following Mode states will be



shown:

- **Manual**
- **Automatic**

Status - One of the following Statuses will be shown:

- **Idle**
- **Increase**
- **Decrease**

The following setpoint boxes have been provided:

- **Bottom of Range**
- **Deadband**
- **Top of Range**
- **Minimum On Time**

CALIBRATION AREA

The nine buttons in this area allow for calibration of the Slide Valve and Slide Stop.

The top button functions as follows:

- **[Start Calibration]** - Selecting this button will automatically perform all 8 steps of the manual calibration.

The following group of eight buttons allow for manually calibrating the Slide Valve and Slide Stop. These buttons are:

- **[Unload Capacity]**
- **[Set Low Capacity]**
- **[Increase Volume]**
- **[Set High Volume]**
- **[Decrease Volume]**
- **[Set Low Volume]**
- **[Load Capacity]**
- **[Set High Capacity]**

To manually calibrate the Slide Valve (capacity) and Slide Stop (Volume):

- Press the **[Unload Capacity]** button. Monitor the voltage relative to the Current value. Once the voltage stops decreasing and holds steady for 10-15 seconds. Press the **[Set Low Capacity]** button.

- Press the **[Increase Volume]** button. Monitor the voltage relative to the Current Volume value. When the voltage stops rising and holds steady for 10-15 seconds. Press the **[Set High Volume]** button.

- Press the **[Decrease Volume]** button. Monitor the voltage relative to the Current value. Once the voltage stops decreasing and holds steady for 10-15 seconds. Press the **[Set Low Volume]** button.

- Press the **[Load Capacity]** button. Monitor the voltage relative to the Current value for Capacity. When the voltage stops increasing and holds steady for 10-15 seconds. Press the **[Set High Capacity]** button.

OPERATING VALUES

The following informational readings are displayed:

Suction

- **Temperature**
- **Pressure**

Discharge

- **Temperature**
- **Pressure**

Oil

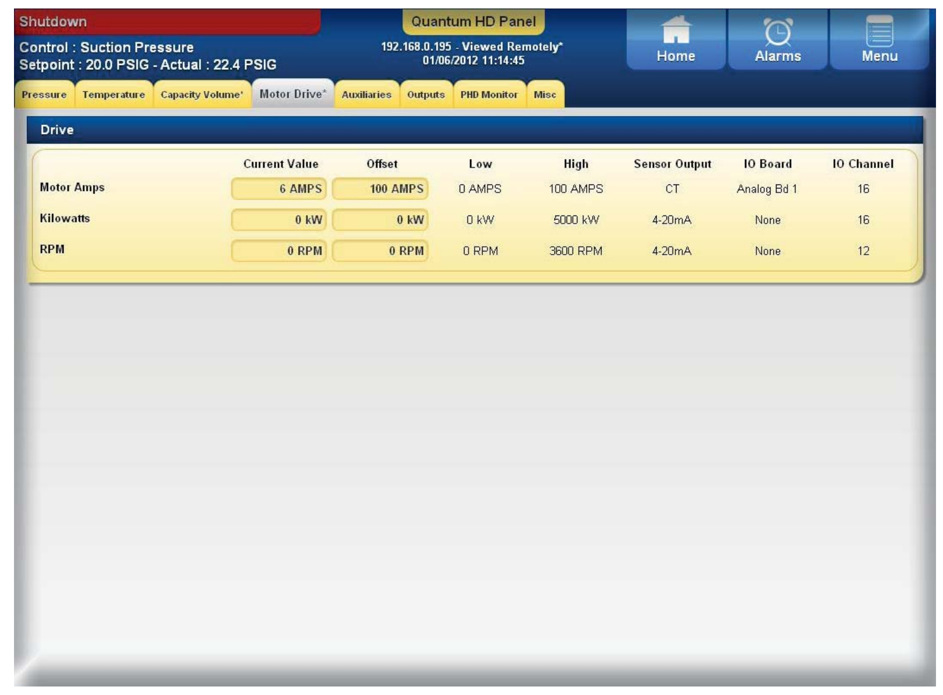
- **Temperature**
- **Pressure**

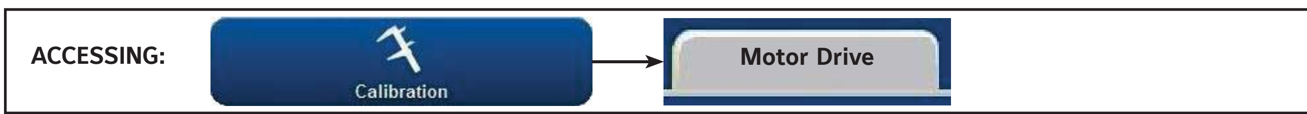
Motor

- **Amps**

CALIBRATION

Motor Drive





DESCRIPTION: This screen is used to view and set motor related calibration values that are not shown on other screens.

This screen should be used anytime a motor related sensor is found to be out of calibration. The recommended practice for adjusting the calibration reading is to first determine which sensor(s) need to be calibrated. Once this is determined, you must know the actual reading that should be showing. This can be accomplished by comparing the Current Value shown, with the actual value using a separate measurement device, such as a Digital Volt Meter, or Current Clamp, etc. Determine the difference between what the Current Value for the sensor is, and what the reading of the separate device shows. As an example, assume that the Motor Amps on this screen reads 120, but a separate device shows a reading of 123. Select either the Current Value box and enter 123 there, or enter the difference between the Current Value and the actual reading (3) into the Offset box. The new reading will now be 123, and should match your separate reading.

The following fields are provided:

DRIVE

Sensors - The following sensor values are displayed along with the unit of measure at the left side of the screen:

- **Motor Amps**
- **Kilowatts**
- **RPM**

[Current Value] - This box will initially show the actual value being read by a sensor. It is also a setpoint box that allows the user to set the current value that is being read by the sensor to a different value, in the case that the calibration is inaccurate, this new value will be added to the actual value to update the offset (see below).

[Offset] - A value entered here will allow the user to compensate for calibration issues with a sensor. This value is then added to the Current Value, to create a new Current Value (see above).

Low - This will show the low end range that the sensor is capable of reading.

High - This will show the high end range that the sensor is capable of reading.

Sensor Output - This will show the current type of sensor that is being used.

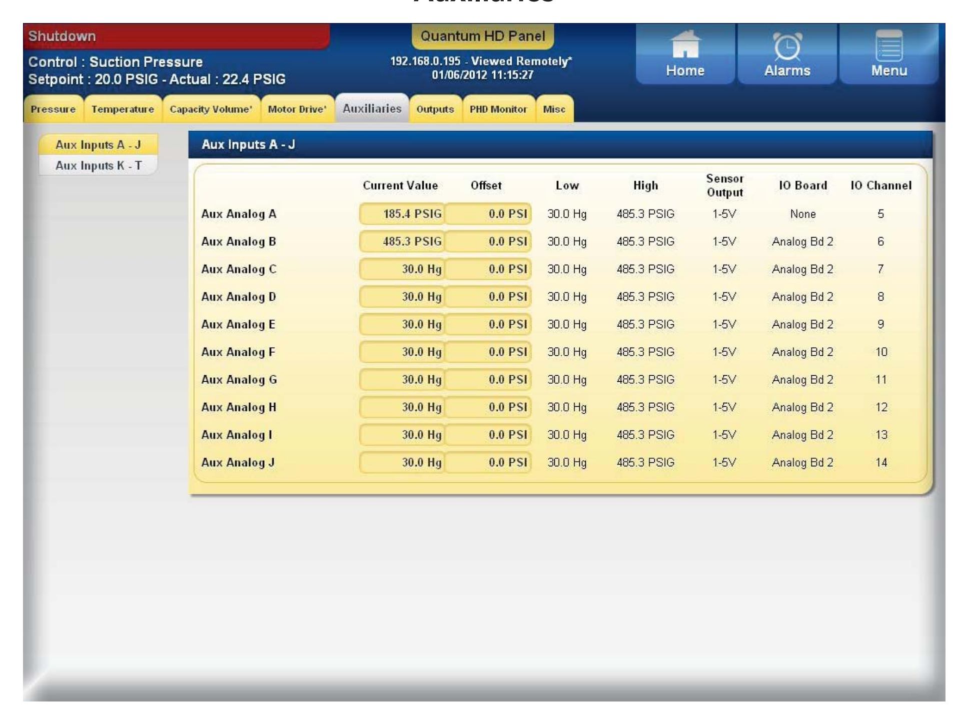
I/O Board - This will show the current I/O board that the sensor is assigned to.

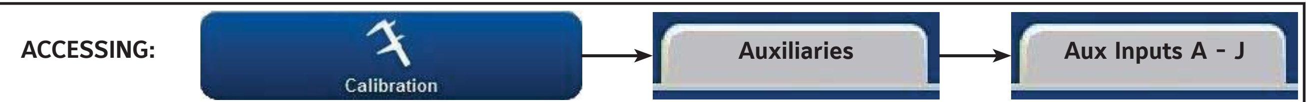
I/O Channel - This will show the current I/O channel that the sensor is assigned to.



CALIBRATION

Auxiliaries





DESCRIPTION: This (Aux Inputs A-j) screen and the Aux Inputs K-T screen is used to view and set Auxiliary Analog Input calibration values that are not shown on other screens.

These screens should be used anytime an Aux Analog sensor is found to be out of calibration. The recommended practice for adjusting the calibration reading is to first determine which sensor(s) need to be calibrated. Once this is determined, you must know the actual reading that should be showing. This can be accomplished by comparing the Current Value shown, with the actual value using a separate measurement device, such as a Digital Volt Meter, or Current Clamp, etc. Determine the difference between what the Current Value for the sensor is, and what the reading of the separate device shows. As an example, assume that the Aux Analog A on this screen reads 120, but a separate device shows a reading of 123. Select either the Current Value box and enter 123 there, or enter the difference between the Current Value and the actual reading (3) into the Offset box. The new reading will now be 123, and should match your separate reading.

The following fields are provided on both screens:

AUX INPUTS A-J (K-T)

Channels - The following channel values are displayed along with the unit of measure at the left side of the screen:

Aux Analog A_J (K-T)
Kilowatts
RPM

[Current Value] - This box will initially show the actual value being read at the channel. It is also a setpoint box that allows the user to set the current value that is being read by the channel to a different value, in the case that the calibration is inaccurate, this new value will be added to the actual value to update the offset (see below).

[Offset] - A value entered here will allow the user to compensate for calibration issues with a channel. This value is then added to the Current Value, to create a new Current Value (see above).

Low - This will show the low end range that the channel is capable of reading.

High - This will show the high end range that the channel is capable of reading.

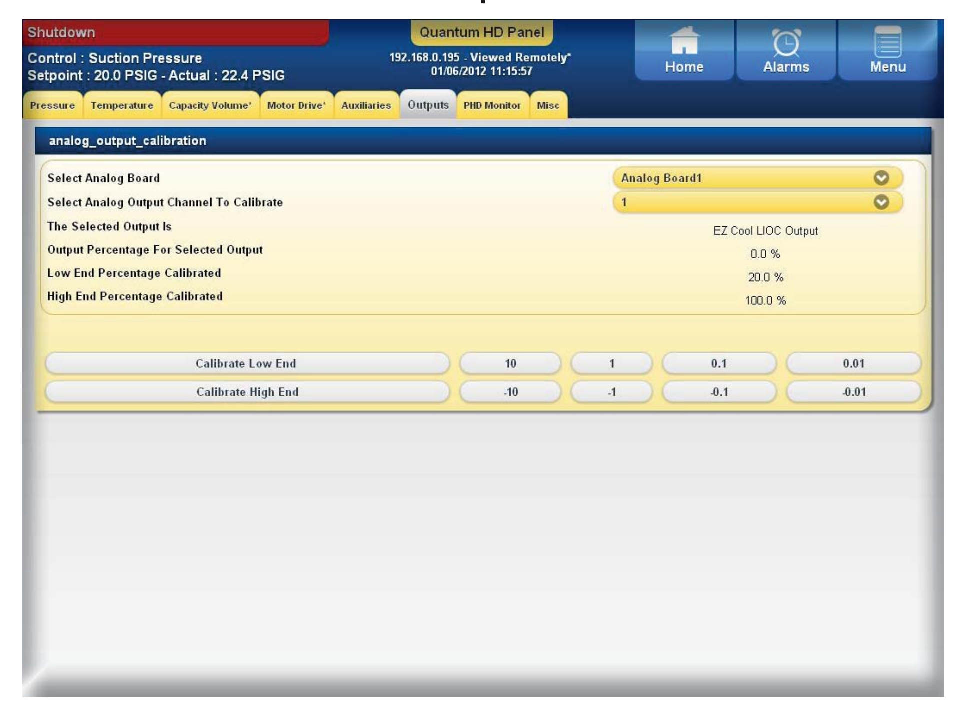
Sensor Output - This will show the current type of sensor that is being used.

I/O Board - This will show the current I/O board that the sensor is assigned to.

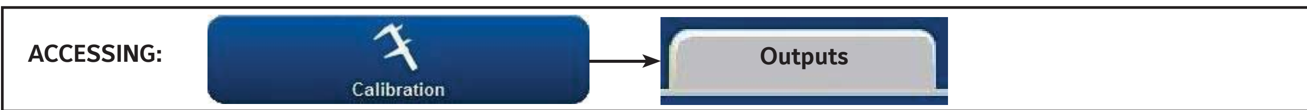
I/O Channel - This will show the current I/O channel that the sensor is assigned to.

CALIBRATION

Outputs



ACCESSING:



DESCRIPTION: This screen is used to calibrate individual analog outputs. NOTE: All analog outputs are calibrated at the factory. The following can be used to confirm or verify this calibration.

Use this screen if an analog output signal (channel) requires calibration.

The Quantum's analog outputs have a range of approximately 0 to 25mA, but most devices that are controlled by the Quantum™ HD require a signal that varies between 4 and 20mA. To restrict the analog outputs to the proper values, each of the outputs must be calibrated before they can be used. Every output channel has a Low End and a High End value that are used for calibration. Both values can be set from 0% to 100%. The output channel's maximum value is represented by 100% and its minimum value is represented by 0%. To calibrate the channel, the High End percentage is decreased until the maximum output for the channel is limited to 20mA. Also, the Low End percentage is increased until the minimum output for the channel is 4mA.

The following fields are provided on this screen:

ANALOG OUTPUT CALIBRATION

Select Analog Board - Select form the following:

- Analog Board 1
- Analog Board 2

Select Analog Output to Calibrate - Select the channel that you wish to calibrate:

- 1 - 8

The Selected Output Is - The name of the output that has been selected is shown here.

Output Percentage For Selected Output - This shows the percent of output signal value that is currently being output for this channel.

Low End Percentage Calibrated - The percentage shown here represents the low (or bottom) end of the calibration value.

High End Percentage Calibrated- The percentage shown here represents the high (or upper) end of the calibration value.

The following calibration selections upper here:

Calibrate Low End - Select this button to set the Low End calibration value, then select the following buttons to achieve the desired setting:

- **10** - The Low End value will increase by 10% each time this button is selected.
- **1** - The Low End value will increase by 1% each time this button is selected.



- **0.1** - The Low End value will increase by 0.1% each time this button is selected.

- **0.01** - The Low End value will increase by 0.01% each time this button is selected.

Calibrate High End - Select this button to set the High End calibration value, then select the following buttons to achieve the desired setting:

- **-10** - The High End value will decrease by 10% each time this button is selected.

- **-1** - The High End value will decrease by 1% each time this button is selected.

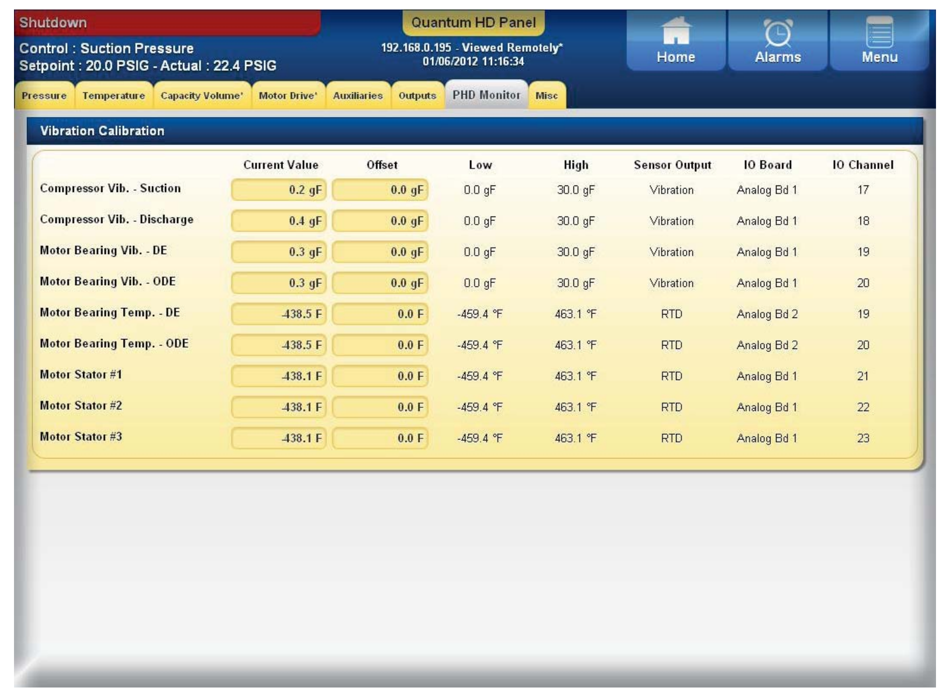
- **-0.1** - The High End value will decrease by 0.1% each time this button is selected.

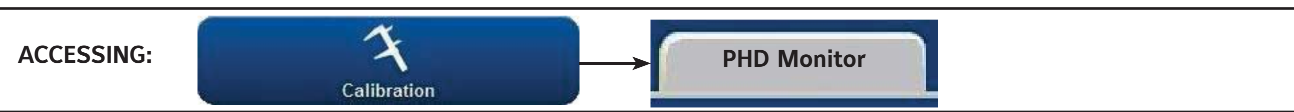
- **-0.01** - The High End value will decrease by 0.01% each time this button is selected.

The analog output channel will return to its control task either when another output channel is selected for calibration or when the user goes to another screen.

CALIBRATION

PHD Monitor





DESCRIPTION: This screen is used to view and set the pressure calibration values.

This screen should be used anytime a vibration sensor is found to be out of calibration. The recommended practice for adjusting the calibration reading is to first determine which sensor(s) need to be calibrated. Once this is determined, you must know the actual reading that should be showing. This can be accomplished by comparing the Current Value shown, with the actual value using a separate vibration measurement device (or temperature probe, depending on the type of sensor). Determine the difference between what the Current Value for the sensor is, and what the reading of the separate device shows. As an example, assume that the Motor Bearing Temp. on this screen reads 135 F, but a separate device shows a reading of 142 F. Select either the Current Value box and enter 142 there, or enter the difference between the Current Value and the actual reading (7) into the Offset box. The new reading will now be 135, and should match your separate reading.

VIBRATION CALIBRATION

Sensors - The following sensor values are displayed along with the unit of measure at the left side of the screen:

- **Compressor Vib. - Suction**
- **Compressor Vib. - Discharge**
- **Motor Bearing Vib. - DE**
- **Motor Bearing Vib. - ODE**
- **Motor Bearing Temp. - DE**
- **Motor Bearing Temp. - ODE**
- **Motor Stator #1**
- **Motor Stator #2**
- **Motor Stator # 3**

[Current Value] - This box will initially show the actual value being read by a sensor. It is also a setpoint box that allows the user to set the current value that is being read by the sensor to a different value, in the case that the calibration is inaccurate, this new value will be added to the actual value to update the offset (see below).

[Offset] - A value entered here will allow the user to compensate for calibration issues with a sensor. This value is then added to the Current Value, to create a new Current Value (see above).

Low - This will show the low end range that the sensor is capable of reading.

High - This will show the high end range that the sensor is capable of reading.

Sensor Output - This will show the current type of sensor that is being used.

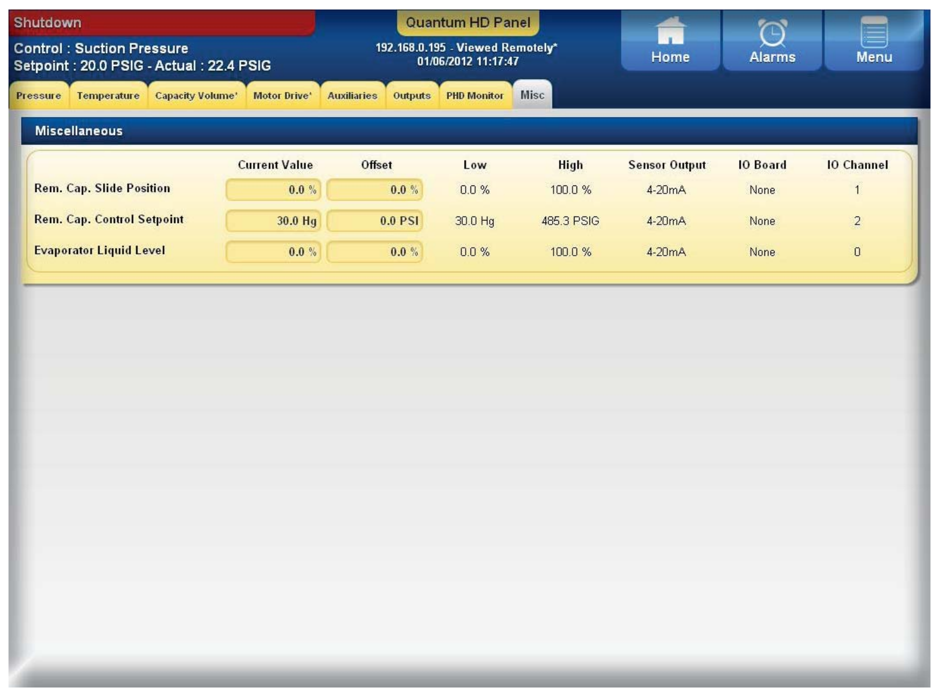
I/O Board - This will show the current I/O board that the sensor is assigned to.

I/O Channel - This will show the current I/O channel that the sensor is assigned to.

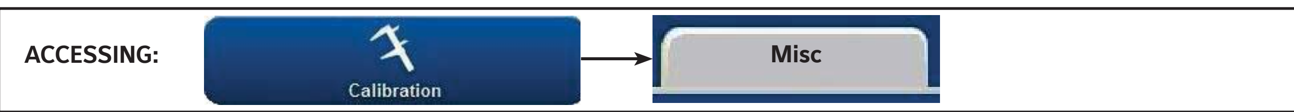


CALIBRATION

Misc



ACCESSING:



DESCRIPTION: This screen is used to view and set sensors that are not included on the other calibration screens.

This screen should be used anytime a misc. sensor is found to be out of calibration. The recommended practice for adjusting the calibration reading is to first determine which sensor(s) need to be calibrated. Once this is determined, you must know the actual reading that should be showing. This can be accomplished by comparing the Current Value shown, with the actual value using a separate measurement device, such as a DVM or temperature probe. Determine the difference between what the Current Value for the sensor is, and what the reading of the separate device shows. As an example, assume that the Remote Cap. Control Setpoint on this screen reads 5 F, but a separate device shows a reading of 7 F. Select either the Current Value box and enter 5 there, or enter the difference between the Current Value and the actual reading (2) into the Offset box. The new reading will now be 5, and should match your separate reading.

MISCELLANEOUS

Sensors - The following sensor values are displayed along with the unit of measure at the left side of the screen:

Rem. Cap. Slide Position
Rem. Cap. Control Setpoint
Evaporator Liquid Level
EZ Cool LIOC Feedback

[Current Value] - This box will initially show the actual value being read by a sensor. It is also a setpoint box that allows the user to set the current value that is being read by the sensor to a different value, in the case that the calibration is inaccurate, this new value will be added to the actual value to update the offset (see below).

[Offset] - A value entered here will allow the user to compensate for calibration issues with a sensor. This value is then added to the Current Value, to create a new Current Value (see above).

Low - This will show the low end range that the sensor is capable of reading.

High - This will show the high end range that the sensor is capable of reading.

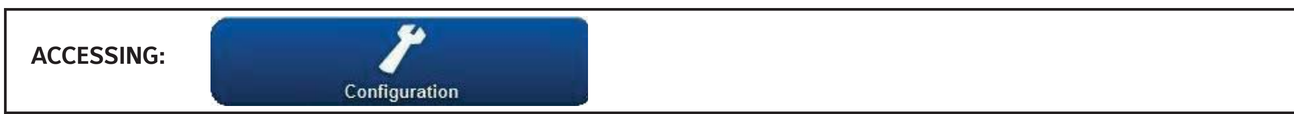
Sensor Output - This will show the current type of sensor that is being used.

I/O Board - This will show the current I/O board that the sensor is assigned to.

I/O Channel - This will show the current I/O channel that the sensor is assigned to.

CONFIGURATION





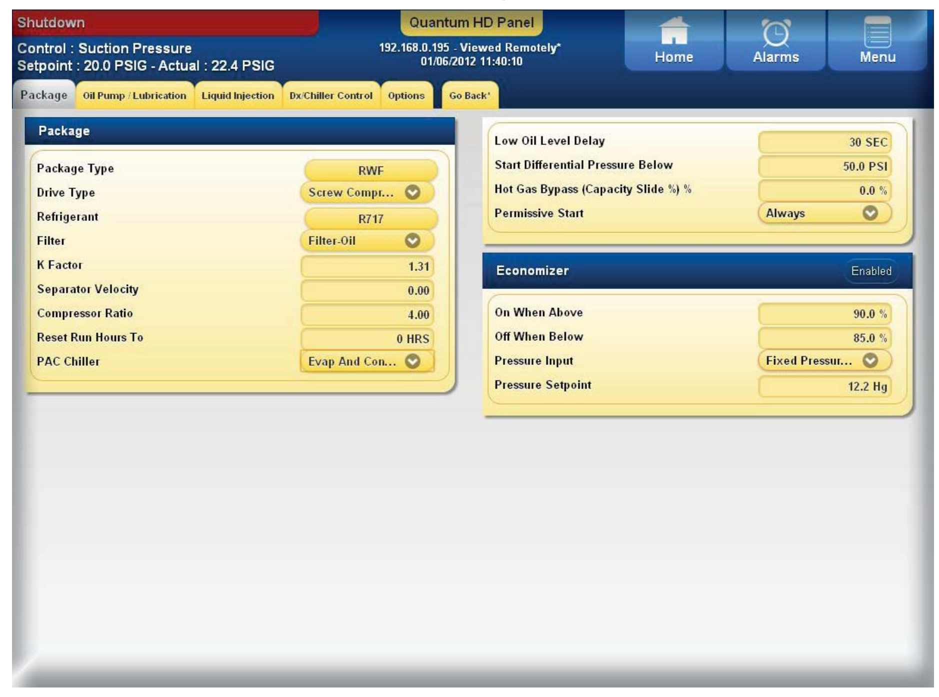
DESCRIPTION: This is the main Configuration screen. From here, all other configuration screens are accessible.

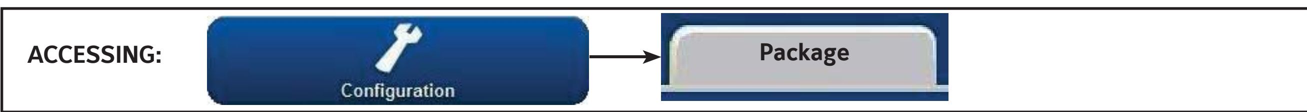
Simply select the button with the title of the configuration that you wish to view, and that screen will appear.



CONFIGURATION

Package





DESCRIPTION: Use this screen to set the basic operational characteristics of the compressor package.

The following areas appear on this screen:

PACKAGE

[Package Type]

- RWF
- RWBII
- RXB
- RXF 12-50
- RXF 58-101
- RDB 4-Step
- RDB 3-Step
- York S7
- Other Manufacturer
- Other Manuf (Mycom)
- Other Manuf (Kobe)
- HPS

NOTE: Refer to the following chart for Package Type equivalencies:

For Compressor Type	Use Compressor Type
RWF	RWF
RWBII	RWBII
RXB	RXB
RXF 12-50	RXF 12-50
RXF 58-101	RXF 58-101
RDB 4-Step	RDB 4-Step
RDB 3-Step	RDB 3-Step
York S7	York S7
Other Manufacturer	Other Manufacturer
Other Manuf (Mycom)	Other Manuf (Mycom)
Other Manuf. (Kobe)	Other Manuf. (Kobe)
HPS	HPS

[Drive Type]

- Screw Compressor With Constant Electric Drive
- Screw Compressor With VFD Drive
- Screw Compressor With Engine Drive
- Screw Compressor With Turbine Drive
- Screw Compressor With DBS
- Screw Compressor With Vyper™ (RAM)
- Screw Compressor With Vyper™ (4-20mA)

[Refrigerant]

R11	R218	R507
R113	R22	R508
R114	R23	R508b
R1150	R290	R600
R12	R401a	R600a
R1270	R402a	R717
R13	R404a	R718
R134a	R410a	R728
R13b1	R50	R729
R14	R500	R744
R14b2	R502	R771
R170	R503	User Defined

[Filter Differential Check] (Comparison)

- Disabled
- Filter-Oil
- Discharge-Oil
- Discharge-Filter

[K Factor] -Used in the calculation of the VI (Slide Stop) position, and is based on the Refrigerant Type. Example: Refrigerant R717 sets a K Factor of 1.30. This value can vary slightly depending upon operating conditions, such as the Suction and Discharge pressures.

[Separator Velocity] - This is a calculated value that represents the percentage of the designed capacity of the separator. Do not change this value without consulting Frick. This value is used in a calculation to prevent the Slide Valve from loading, to prevent oil carrry-over out of the separator and into the system due to a high velocity (flow) of the refrigerant gas through the separator. If this value is 0 (zero), it has not been properly configured.

[Compressor Ratio] - This value represents the Compressor Ratio of the compressor. Do not change this value without consulting Frick. This value is used in a calculation to prevent the Slide Valve from loading, to prevent oil carrry-over out of the separator and into the system due to a high velocity (flow) of the refrigerant gas through the separator. If this value is 4.0, it has not been properly configured.

[Reset Run Hours] - Selecting this button will allow the Run Hours to be set to any value. This is best used for maintenance purposes.

[PAC Chiller]

- No
- Evap And Condenser Temps
- Evap Temps Only
- Evap Leaving Temp Only

[Low Oil Level Delay] - The time that must elapse before the Low Oil Level Shutdown can be initiated.

[Start Differential Pressure Below] – The compressor will be inhibited from starting if the difference between the Discharge Pressure minus the Suction Pressure is greater than this setpoint.

[Hot Gas Bypass (Capacity Slide %) %] - This feature is optional, and the compressor must be configured to use this. When the Slide Valve is below this setpoint, the Hot Gas Bypass output (digital board 1, channel 16) will energize to allow hot gas (Discharge Pressure) to be re-circulated back into the compressor. This allows the compressor to continue to run when the actual load doesn't require the compressor to run.

[Permissive Start] – The input used for this feature is Module 20 of digital board 1. This feature has three possible states:

- **Disabled** – The feature is disabled
- **Starting** – This input needs to be energized only to start the compressor.
- **Always** – This input must be energized to start the compressor. If the compressor is running, and this input is de-energized, the compressor is stopped.

ECONOMIZER

[On When Above] - If the compressor is running, the Capacity is compared to this setpoint and if the Capacity setpoint is above this value, the Economizer output will be on.

[Off When Below] - If the compressor is running, the Capacity setpoint is compared to this value and if the Capacity setpoint is below this value, the Economizer output will be off.

[Pressure Input]

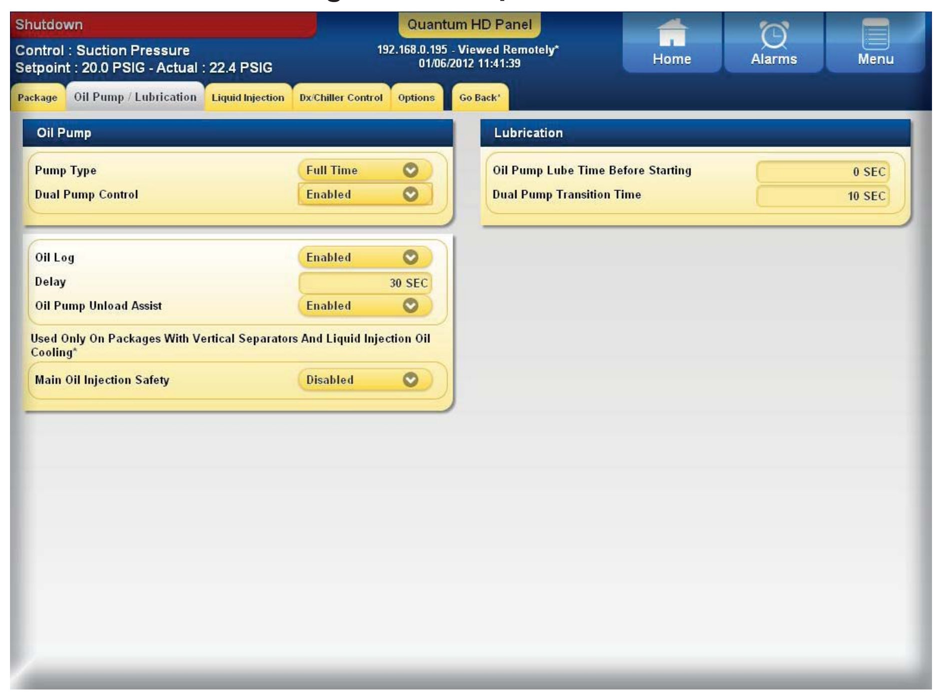
- **Disabled**
- **Fixed Pressure Setpoint** – If selected, then the Pressure Setpoint (see below) is used to calculate the Volume Ratio.
- **Economizer Analog Input** – If selected, then this Input value will be used in calculating the Volume Ratio.

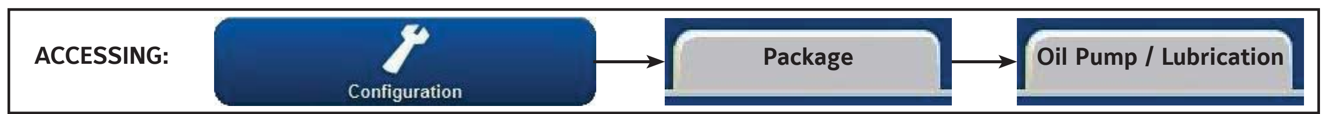
[Pressure Setpoint] - This is the setpoint value that will be used when the Pressure Input is set to fixed, to calculate the Volume Ratio.



CONFIGURATION

Package - Oil Pump / Lubrication





DESCRIPTION: This is the Oil Pump / Lubrication setup screen. Use this screen to set the basic operational characteristics of the oil and lubrication system.

OIL PUMP

[Pump Type]

- No Pump
- Full Time
- Demand
- Shaft With Auxiliary
- Shaft

[Dual Pump Control]

- **Disabled** – Dual Pump is disabled.
- **Enabled**

[Oil Log]

- **Disabled** – Oil Log is disabled.
- **Enabled** – If for the Oil Log Delay setpoint period, the oil pump has been on and the compressor is Off or Starting without going into Running, an Oil Log shutdown will occur.

[Oil Pump Unload Assist] - This is to assist in unloading the slide valve when a Full Time or Demand pump is selected. When this option is enabled, it allows the pump output to energize when starting the compressor, if the slide valve position is above the “Highest Capacity to Permit Starting” setpoint.

- **Disabled** – Oil Pump Unload Assist is disabled.
- **Enabled** – Oil Pump Unload Assist is enabled.

[Main Oil Injection]

- **Is Above (Setpoint)** - The Main Oil Injection output will energize when the Discharge Temperature exceeds this setpoint.
- **For (Delay)** – Once the Main Oil Injection output has been energized by the above setpoint, it will remain energized for this amount of time.

LUBRICATION

[Oil Pump Lube Time Before Starting] - The amount of time that the compressor will be delayed from starting to allow the Oil Pump to pre-lube the compressor components.

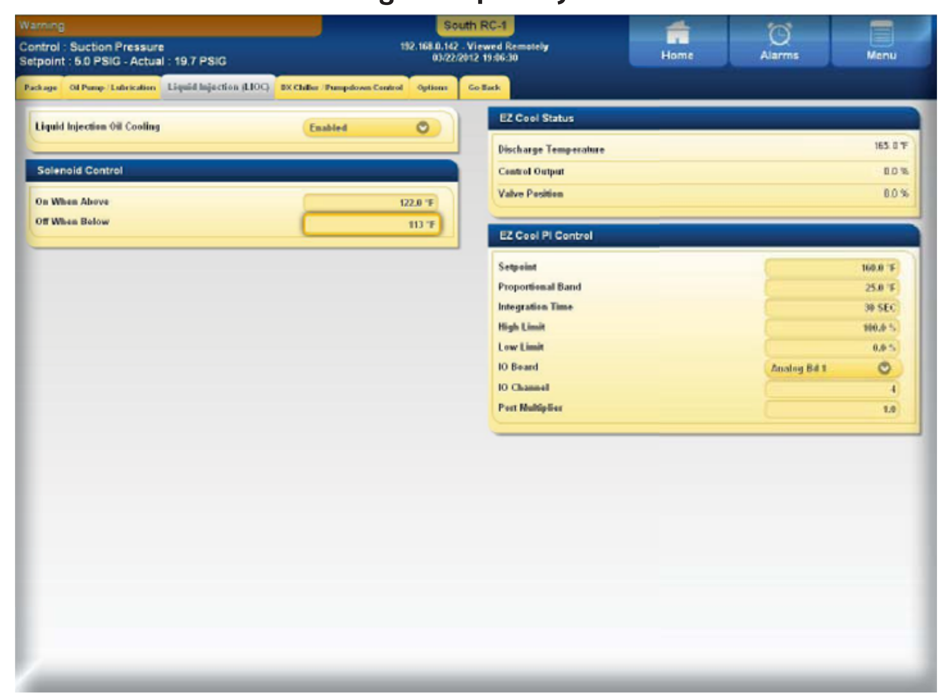
[Dual Pump Transition Time] - If enabled. The lead pump is the pump selected to be the first pump to run. If the lead pump has a pump auxiliary failure,

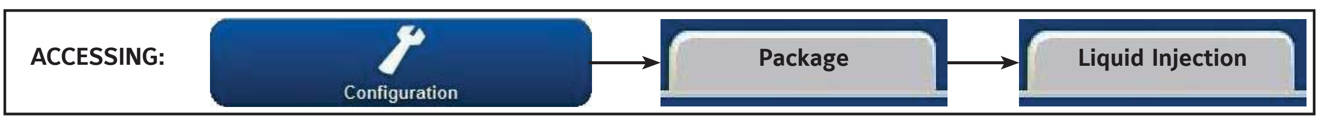
an alarm message is issued and the other pump will be turned on. If the compressor has a Low Oil Pressure Warning failure, the second pump will be turned on; then after a 30 seconds delay, the lead pump will be turned off. If while the compressor is running the second pump has an auxiliary failure or Low Oil Pressure is encountered, a shutdown message and action is issued.



CONFIGURATION

Package - Liquid Injection





DESCRIPTION: This screen allows the user to enter and view the operating parameters related to EZ Cool LIOC PI control.

The following are the EZ Cool LIOC Setup screen selections available on this screen:

EZ Cool

- **Disabled**
- **Enabled**

SOLENOID CONTROL

An output is provided for an optional Liquid Injection solenoid valve. The function of this output is only available if the compressor has Liquid Injection oil cooling and it has been enabled. Liquid Injection controls the supply of liquid refrigerant to the compressor. Liquid Injection is off (the solenoid is closed) if the compressor is off.

[On When Above] - When the Discharge Temperature is above this setpoint, the Liquid Injection solenoid output will energize, until the Discharge Temperature drops below this setpoint.

[Off When Below] - When the Discharge Temperature is below this setpoint, the Liquid Injection solenoid output will de-energize, until the Discharge Temperature raises above this setpoint.

EZ COOL STATUS

Discharge Temperature - The actual Discharge temperature is shown here.

Control Output - The value of the Output signal as controlled by the PI. This is not a setpoint value.

Valve Position - The value shown here represents the position of the valve with relationship to the Control Output.

EZ COOL PI CONTROL

[Setpoint] - Enter the value that you wish to control to.

[Proportional Band] – This setpoint determines the size of a region either above or below the Control Setpoint. Within this region, the Proportional component of the PI Output value is the number between 0% and 100% that directly corresponds to the difference between the Control Input (Actual) and the Control Setpoint (Setpoint). Outside of this region, the Proportional component is either 100% or 0%. If the PI's Action is Forward, the Proportional Band extends above the Control Setpoint. If the PID's Action is Reverse, the Proportional Band extends below the Control Setpoint.

[Integration Time] - This setpoint controls the in-

fluence that the Integral component exerts on the PI Output value. The Integral component works to push the Control Input toward the Control Setpoint by tracking the difference between the Control Input and the Control Setpoint over time.

High Limit - The highest value that the output can be.

Low Limit - The lowest value that the output can be.

I/O Board - Select from one of the following:

- **None**
- **Analog Board 1**
- **Analog Board 2**

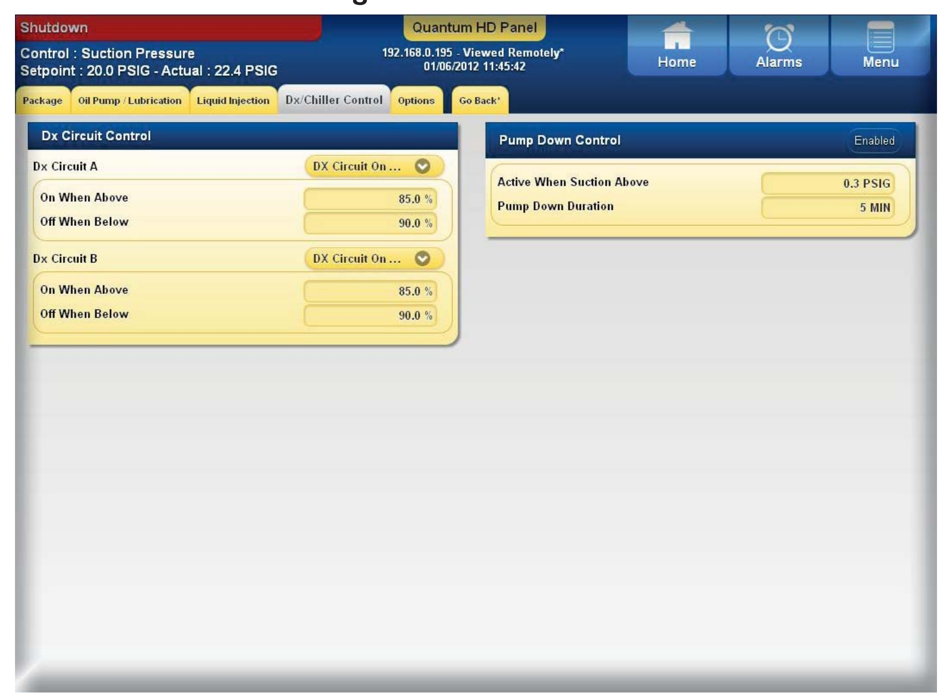
I/O Channel - Select the output channel that will be used.

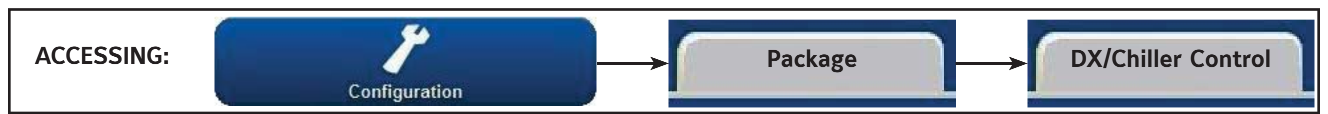
Port Multiplier – If the Economizer is On and the Pressure Input selection is not Disabled, this setpoint is used in calculating the Volume Ratio. A value of 1.6 is used for RXF models, and a value of 1.4 is used for RWF models.



CONFIGURATION

Package - Dx / Chiller Control





DESCRIPTION: Use this screen to set the operational characteristics of the Dx / Chiiller system.

DX CIRCUIT CONTROL

DX Circuit A - The following are digital outputs:

- **Disabled** – DX Circuit A is off.
- **DX Circuit On with compressor** – DX Circuit A is on if the compressor is on, or it is off if the compressor is off.
- **DX Circuit On by Capacity Position** - When this option is selected, two other setpoints are shown:
  - **Off When Below**.
  - **On When Above**.

  DX Circuit A is turned On when the Capacity Position is above the On When Above setpoint, and it is turned Off when the Capacity Position is below the Off When Below setpoint.

DX Circuit B - The following are digital outputs:

- **Disabled** – DX Circuit B is off.
- **DX Circuit On with compressor** – DXCircuit B is on if the compressor is on, or it is off if the compressor is off.
- **DX Circuit On by Capacity Position** - When this option is selected, two other setpoints are shown:
  - **Off When Below**.
  - **On When Above**.

  DX Circuit B is turned On when the Capacity Position is above the On When Above setpoint, and it is turned Off when the Capacity Position is below the Off When Below setpoint.

PUMP DOWN CONTROL

With this option enabled, Pump Down provides for pumping down the refrigerant (removal of the refrigerant gas). For example, this can be used for removing the refrigerant from a shell and tube heat exchanger to prevent its standing water from freezing. When Pump Down is enabled and the compressor is stopped the DX circuits digital outputs are de-energized but the compressor remains running for the delay period. When the delay period times out, or the Suction Pressure falls below the On When Suction Above setpoint, the compressor is turned off. To force a compressor that is in Pump Down to stop, press the

compressor stop screen command key again.

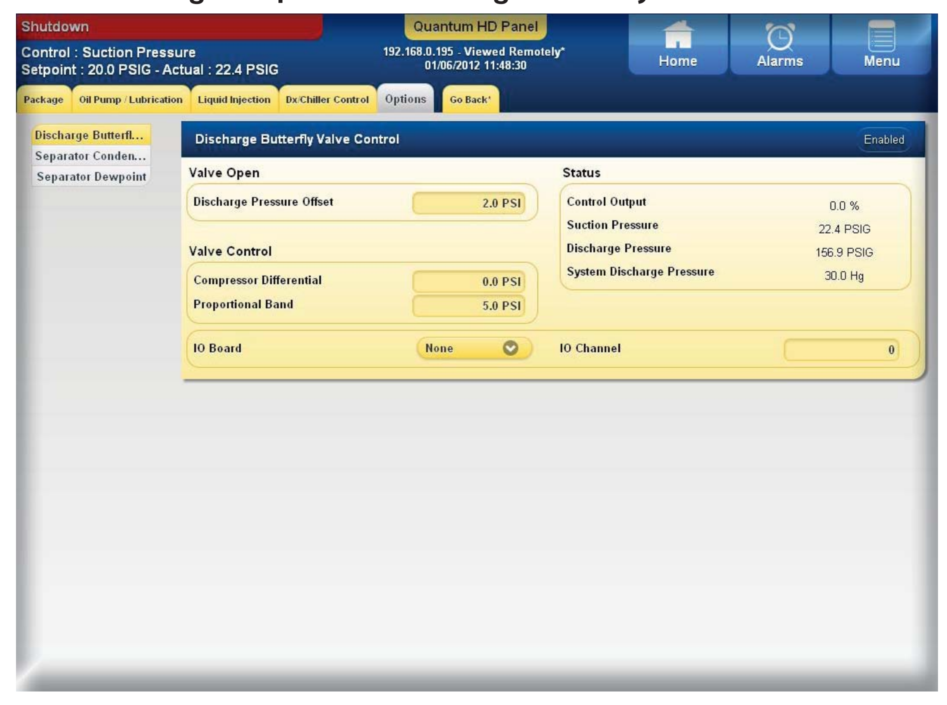
The following selections are provided:

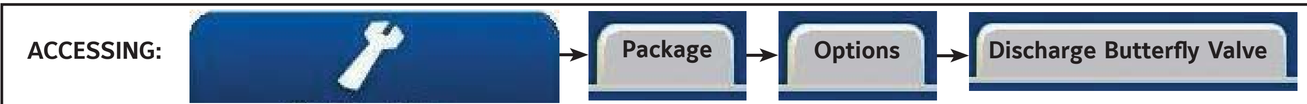
- **Disabled** - The Pump Down feature is ignored.
- **Enabled** - The Pump Down feature will be utilized.
- **[On When Suction Above]** - After sending the compressor stop command, if the Suction Pressure reading is above this setpoint, Pump Down will be invoked. In Pump Down, the compressor will stay on to continue vaporizing the refrigerant.
- **[On When Suction Above Delay]** - The amount of time in minutes that the compressor will Pump Down before it is stopped.



CONFIGURATION

Package - Options - Discharge Butterfly Valve Control





DESCRIPTION: Use this screen to set the operational characteristics of the Discharge Butterfly Valve.

DISCHARGE BUTTERFLY VALVE CONTROL

Discharge Butterfly Valve Control

- **Disabled**
- **Enabled**

Valve Open

Discharge Pressure Offset

Valve Control

Compressor Differential

Proportional Band

Status

The values shown in this box are informational only:

Control Output - This shows the percentage value that the Control Output is currently at.

Suction Pressure - The actual Suction Pressure is shown here.

Discharge Pressure - The actual Discharge Pressure is shown here.

System Discharge Pressure- The actual System Discharge Pressure is shown here.

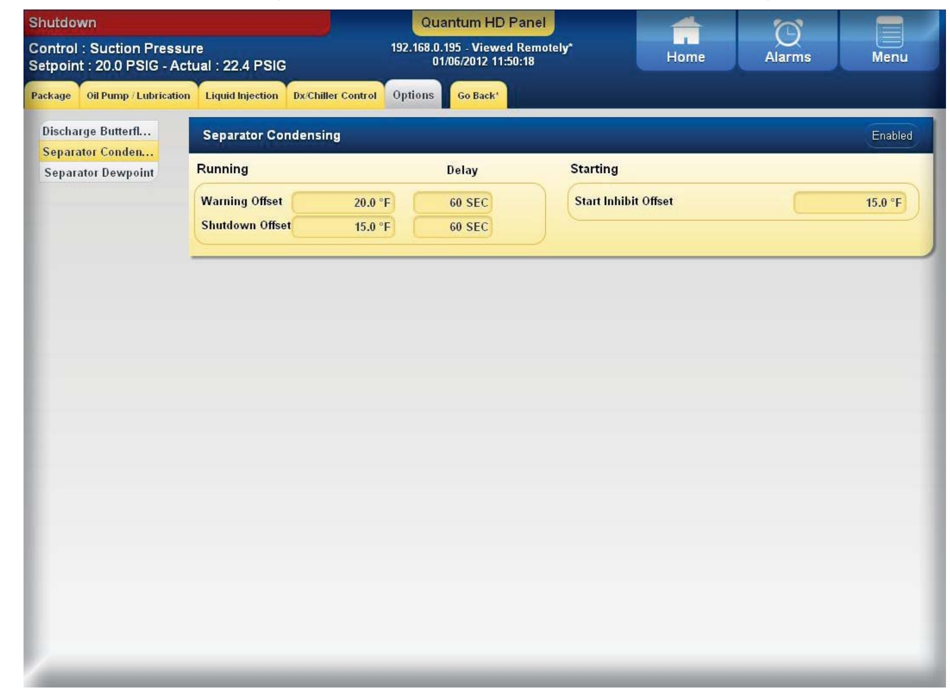
I/O Board - Select from one of the following:

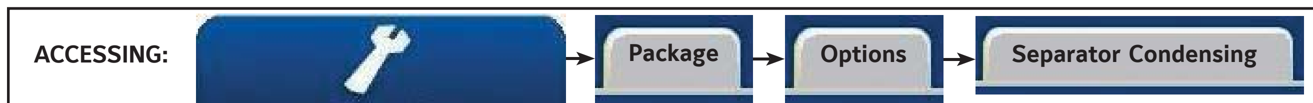
- **None**
- **Analog Board 1**
- **Analog Board 2**

I/O Channel - Enter the output channel that will be used.

CONFIGURATION

Package - Options - Separator Condensing





DESCRIPTION: Use this screen to set the operational characteristics of the Separator Condenser.

SEPARATOR CONDENSING

Separator Condensing

- **Disabled**
- **Enabled**

Running

- **Warning Offset**
- **Warning Delay**
- **Shutdown Offset**
- **Shutdown Delay**

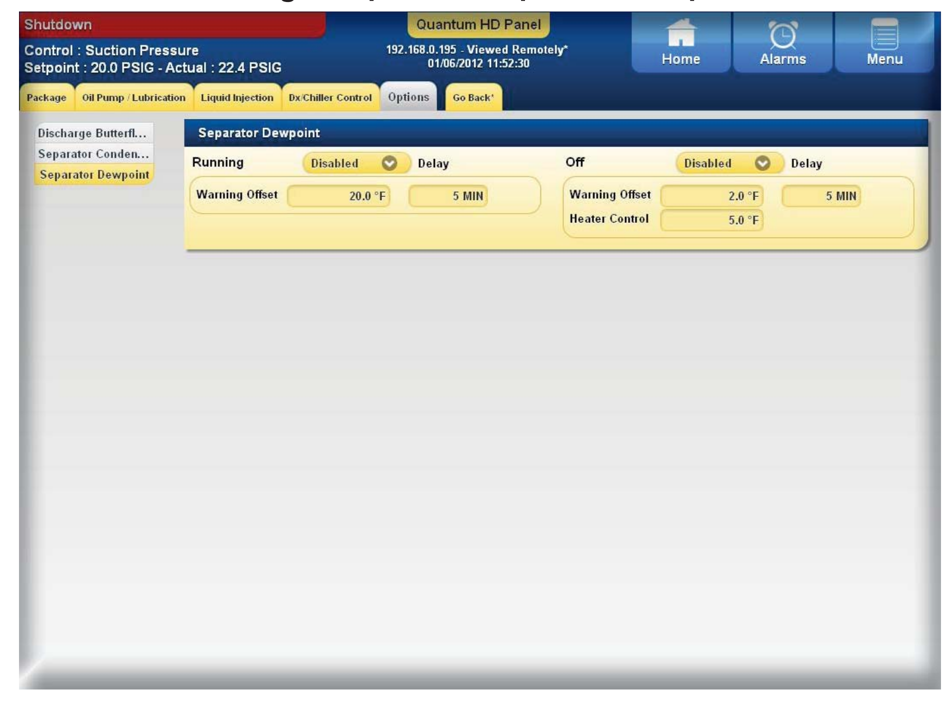
Starting

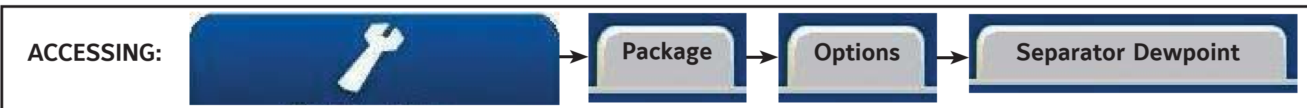
- **Start Inhibit Offset**



CONFIGURATION

Package - Options - Separator Dewpoint





DESCRIPTION: Use this screen to set the operational characteristics of the Separator Dewpoint.

SEPARATOR DEWPOINT

Running

- **Disabled**
- **Enabled**

The following setpoints are provided:

- **Warning Offset**
- **Warning Delay**

Off

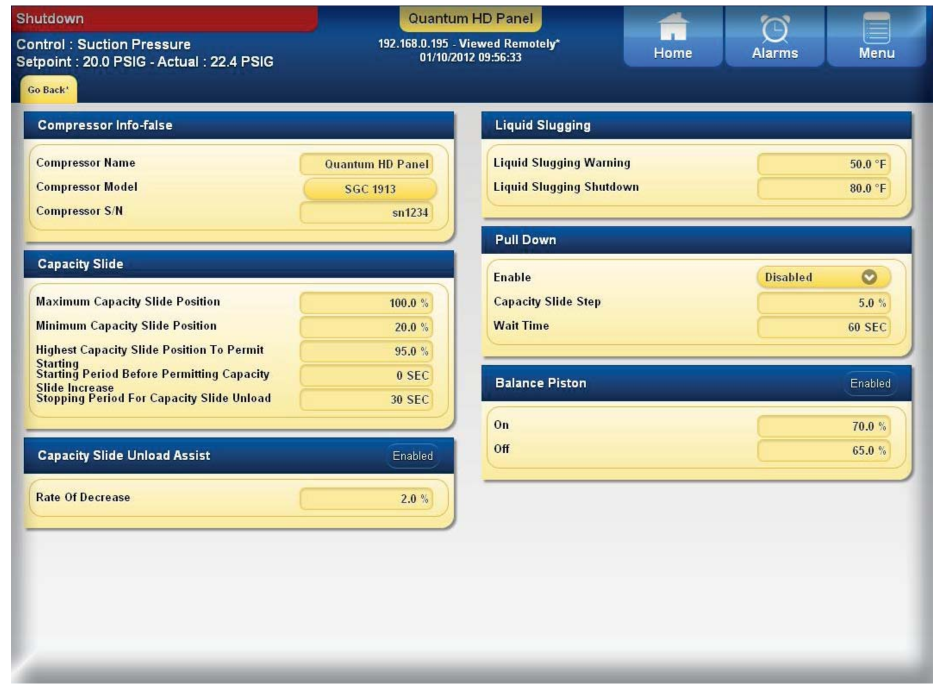
- **Disabled**
- **Enabled**

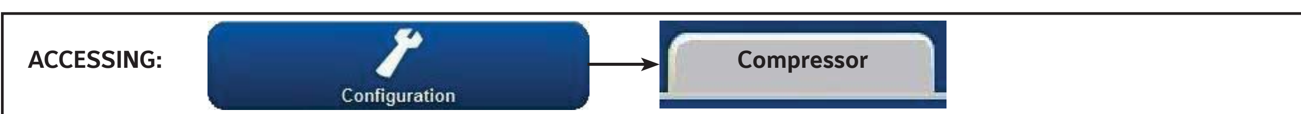
The following setpoints are provided:

- **Warning Offset**
- **Warning Delay**
- **Heater Control**

CONFIGURATION

Compressor





DESCRIPTION: Use this screen to set the operational characteristics of the compressor.

COMPRESSOR INFO

[Compressor Name] - An alpha-numeric name will be shown here. Select this button to change the name.

[Compressor Model] - Selecting this button will cause a pop-up list of compressor models to appear. Select the model for this compressor.

[Compressor S/N] - This will show the serial number for the compressor. Only qualified service personnel should ever change this.

CAPACITY SLIDE

[Maximum Capacity Slide Position] – When in Automatic Mode, this value specifies the maximum percentage that the Slide Valve will be permitted to load to. There are two pre-defined ranges that are applied to this setpoint:

If the Maximum Capacity Position were to be set to 90%, the Slide Valve would be permitted to load to 86% (this 86% values is arrived at by subtracting 4% to the Maximum Capacity Position setpoint). Once reaching 86%, the Load signal would be turned off, allowing the Slide Valve to continue increase if necessary.

If the position reached 88% (2% predefined value) the Unload signal would be proportionally pulsed in an attempt to lower the value back down below the 86%. If, even with the Unload signal being pulsed, the Slide valve position continues to increase, it will be permitted to do so until it reaches 90%, at which time the Unload signal will be turned fully on, and will remain on until the Slide Valve position decreases below the 90% value where the Unload signal will again be proportionally pulsed.

If set to 100%, this portion of the logic will be disabled.

[Minimum Capacity Slide Position] – When in Automatic Mode, this value specifies the minimum percentage that the Slide Valve will be permitted to unload to. There are two pre-defined ranges that are applied to this setpoint:

If the Minimum Capacity Position were to be set to 30%, the Slide Valve would be permitted to unload to 34% (this 34% value is arrived at by adding 4% to the Minimum Capacity Position setpoint). Once reaching 34%, the Unload signal would be turned off, allowing the Slide Valve to continue decreasing if necessary.

If the position reached 32% (2% predefined value) the Load signal would be proportionally pulsed in



an attempt to raise the value back up above the 34%. If, even with the Load signal being pulsed, the Slide valve position continues to drop, it will be permitted to do so until it reaches 30%, at which time the Load signal will be turned fully on, and will remain on until the Slide Valve position increase above the 30% value, where the Load signal will again be proportionally pulsed.

If set to 0%, this portion of the logic will be disabled.

[Highest Capacity Slide Position to Permit Starting] – The Slide Valve position must be equal to or less than this setpoint to allow the compressor to start.

[Starting Period Before Permitting Capacity Slide Increase] – This setpoint indicates the time period after the compressor goes to the Running State that the Slide Valve will not be allowed to load.

[Stopping Period For Capacity Slide Unload] – When the compressor is commanded to stop, the Slide Valve will unload for this period, or until the Slide Valve is at or below the Highest Capacity to Permit Starting setpoint.

CAPACITY SLIDE UNLOAD ASSIST

[Rate of Decrease] - This control will break the possible hydraulic lock between the slide stop and slide valve that may occur, particularly with large diameter rotors (283 & 355mm compressors). If the Vi (volume ratio) is 4.8 or lower and the slide valve is 100%, then the slide stop will be given an increase command simultaneous to the slide valve unload command. Once the slide valve has moved by a value in percent that is equal to the Capacity Unload Assist setpoint, a decrease command will be given to the slide stop while the slide valve continues to receive a unload command. If the Vi or volume ratio is greater than 4.8 and the slide valve is 100% the slide stop will be given a decrease signal simultaneous with a slide valve unload signal. Once the slide valve is seen to have moved by a value in percent that is equal to the Capacity Unload Assist setpoint, the slide stop will be allowed to move back to the proper operating position based on compression ratio.

LIQUID SLUGGING

Liquid Slugging Warning] - This warning is triggered from a sudden decrease in Discharge Temperature that is greater than the Liquid Slug Warning setpoint occurring in a five (5) second period of time. That is, if the Discharge Temperature is 130 degrees F, and the Liquid Slugging Warning setpoint is 10 degrees F, then a sudden drop in Discharge Temperature from 130 to 120 degrees F within a five second period will generate a warning condition.

[Liquid Slugging Shutdown] - This shutdown is triggered from a sudden decrease in Discharge Temperature that is greater than the Liquid Slugging Shutdown setpoint occurring in a five (5) second period of time. That is, if the Discharge Temperature is 130 degrees F, and the Liquid Slug Shutdown setpoint is 20 degrees F, then a sudden drop in Discharge Temperature from 130 to 110 degrees F within a five second period will generate a shutdown condition.

PULL DOWN - With this option enabled, the Suction Pressure can be slowly lowered in steps. Slowly walking the pressure down prevents rapid drops in system pressure that may cause boiling of refrigerant in the system. The following selections are provided:

[Enable]

- **Disabled** - The Pull Down feature is ignored.
- **Enabled** - The Pull Down feature will be utilized.

[Capacity Slide Stop] - The percentage of travel that the Slide Valve is permitted to load upon Compressor starting, and thereafter determined by the Amount of Time setpoint. For example, if this setpoint is 5%, and the Amount of Time setpoint is 1 Minute, then the Slide Valve will be permitted to load 5% of its stroke every minute, until such time as the compressor has reached capacity. It would take 20 minutes for the Slide Valve to fully load to 100% at this rate. Once capacity has been achieved, this function is ignored, until such time as the compressor is restarted.

[Wait Time] - The amount of time between when the Slide Valve is permitted to move. See Capacity Slide Stop description.

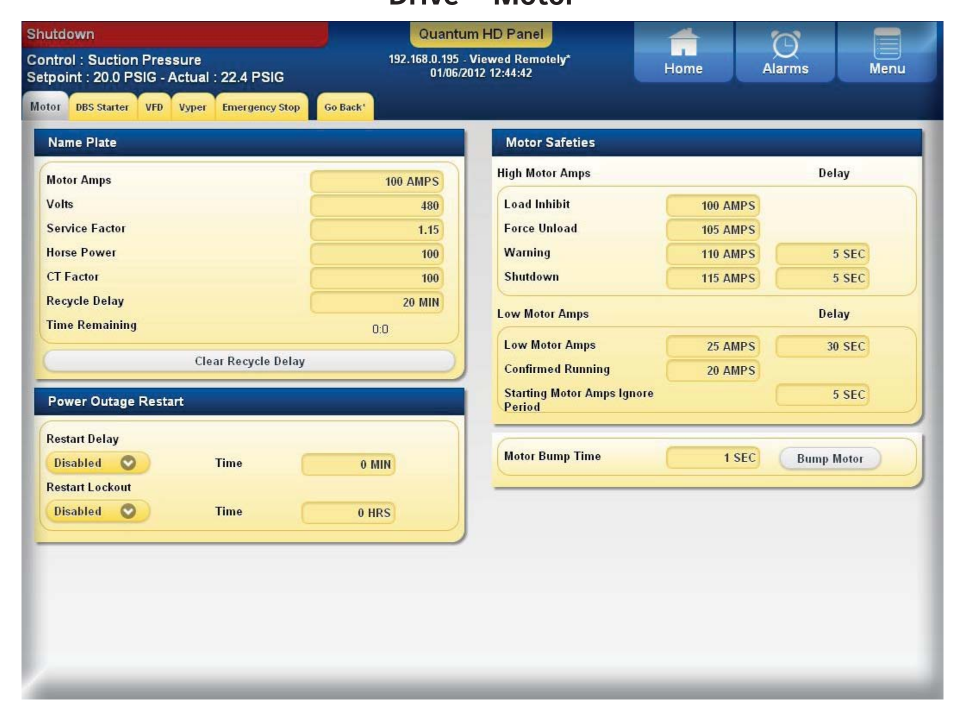
BALANCE PISTON

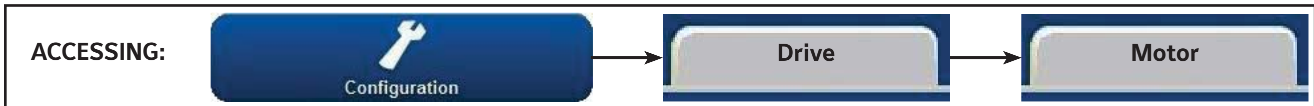
[On]

[Off]

CONFIGURATION

Drive - Motor





DESCRIPTION: Use this screen to set the specific Drive safeties information for a constant speed electric drive motor. These safeties are important for the safe operation of the compressor and motor.

The information that appears on this screen will also be repeated for most other types of motor drives. The following pull-down menus and setpoint boxes are shown here. This information should be recorded from the motor nameplate:

NAME PLATE

- **[Motor Amps]** – Enter the value from the motor nameplate.
- **[Volts]** – Enter the value from the motor nameplate.
- **[Service Factor]** - Not required if using RAM DBS.
- **[Horse Power]** – Enter the value from the motor nameplate.
- **[CT Factor]** - The Current Transformer Factor is printed on the current transformer in the compressor motor starter. Note: Not required if using RAM DBS.

  To verify that the CT has been sized properly, use the following equation:

  CTF = FLA (Full Load Amps) x Service Factor x 1.1 = Recommended CT (Round up to next highest 100 Amps)

  EXAMPLE: FLA = 182 Amps
  sF = 1.15

  CTF = (182 x 1.15 x 1.1) = 230.23 > Round up to 300 [use 300:5 CT]

- **[Recycle Delay]** - Each time the compressor is started this value will be loaded into the Recycle Delay timer. This time must elapse prior to allowing the compressor to restart. The timer will time out while the compressor is running or stopped since the Recycle Delay is a start-to-start protection. The Recycle Delay time is intended to prevent damage to the motor from successive restarts.

  NOTE: Consult Motor Manufacturer for the recommended duration of the Recycle Delay.

- **[Clear Remaining Delay]** – This selection will clear the remaining delay time, allowing the motor to be re-started immediately. WARNING!!! This may cause damage to the compressor motor.



POWER OUTAGE RESTART

Restart Delay - Will stagger the starting of compressors after power is restored to prevent multiple compressors from starting at the same time.

- **Disabled**
- **Enabled**
- **Time**

Restart Lockout - Prevents compressor from starting after a power outage that lasts longer than the setpoint.

- **Disabled**
- **Enabled**
- **Time**

MOTOR SAFETIES

High Motor Amps (Considering a 1.15 SF)**:**

- **[Load Inhibit]** - The compressor slide valve will be prevented from loading until the Motor Amps is less than this setpoint.

  TYPICAL SETTING: Motor Amps Stop Load = FLA x 100%

- **[Force Unload]** - When the Motor Amps is greater than or equal to this setpoint, the compressor Slide Valve will be forced to unload.

  TYPICAL SETTING: Motor Amps Force UnLoad = FLA x 105%

- **[Warning]** - If the Motor Amps is greater than or equal to this setpoint, for the warning time delay, a warning occurs.
  - **[Warning Delay]** - The minimum time in seconds that the Motor Amps is greater than or equal to the High Motor Amps Warning setpoint before notification of the warning.
- **[Shutdown]** - If the Motor Amps is greater than or equal to this setpoint, for the shutdown time delay, the compressor will shut down.
  - **[Shutdown Delay]** - The minimum time in seconds that the Motor Amps is greater than or equal to the High Motor Amps Shutdown setpoint before the compressor will shut down.

Low Motor Amps:

- **[Low Motor Amps Shutdown]** – This setpoint is used to determine if the coupling has broken. If the Motor Amps is less than or equal to this setpoint, for the shutdown time delay, the compressor will shut down.
- **[Low Motor Amps Shutdown Delay]** – The minimum time in seconds that the Motor Amps is less than or equal to the Low Motor Amps] Shutdown setpoint before the compressor will shut down.
- **[Confirmed Running Motor Amps]** – The measured Motor Amps must be greater than or equal to this setpoint before the compressor will transition from Starting to Running.
- **[Starting Motor Amps Ignore Period]** – After the compressor is commanded to start, this setpoint indicates the period during which the High Motor Amps Load Inhibit and Force Unload checks are not performed.

The following selection will allow the technician to manually energize, or bump, the compressor motor for the purpose of determining motor rotation.

The following setpoint box has been provided:

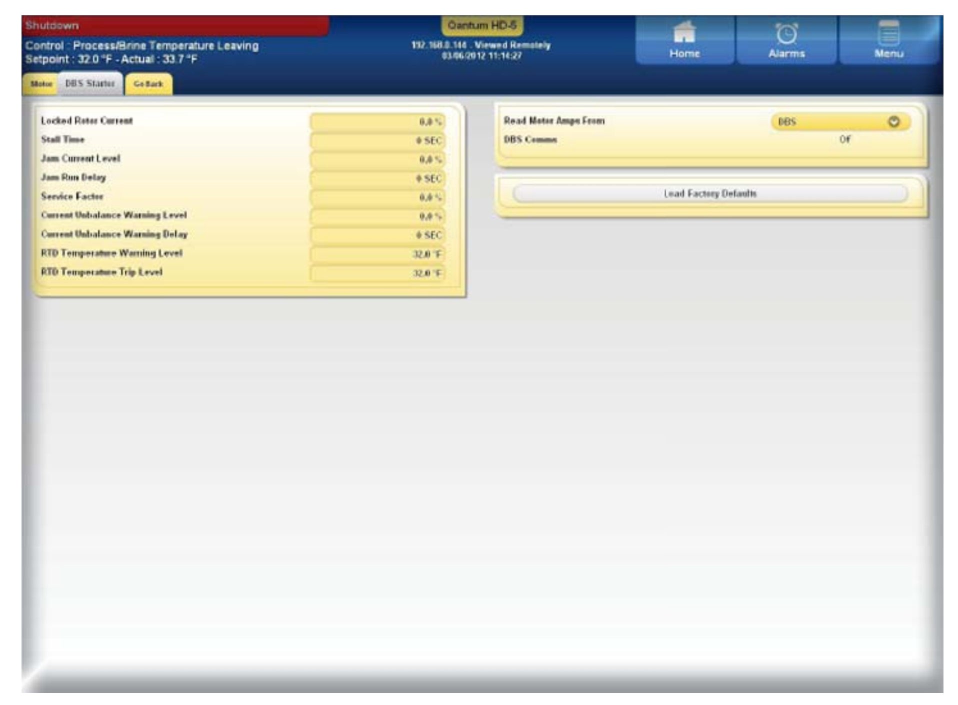
- **Motor Bump Time** – Set this value to the length of time that you wish to have the compressor motor energized, or "bumped". The range is 0.0 to 15.0 seconds.

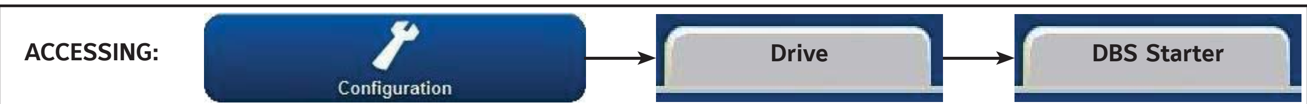
The following user selectable buttons are provided:

- **[Bump Motor]** – When this button is selected, the compressor motor will be energized, or "bumped" for the period of time as set in the Motor Bump Time setpoint box.

CONFIGURATION

Drive - DBS Starter





DESCRIPTION: Use this screen to set the specific Drive safeties information for a DBS motor starter. The purpose of a DBS motor starter is to accelerate the motor in a smooth stepless motion, therefore it reduces supply voltage dip during motor start, and mechanical shock on the compressor. These safeties are important for the safe operation of the compressor and motor.

DBS STARTER

The following setpoint boxes are provided. These setpoints are updated via communications to the DBS controller. When a setpoint has been changed at the Quantum™ HD, it is sent to and updates the DBS:

- Locked Rotor Current
- Stall Time
- Jam Current Level
- Jam Run Delay
- Service Factor
- Current Unbalance Alarm Level
- Current Unbalance Warning Delay
- RTD Temperature Warning Level
- RTD Temperature Trip Delay

A pop-up menu is provided:

Read Motor Amps From – Choose one of the following selections to determine where to read the Motor Amps from:

- **DBS** – Read the Motor Amps directly from the DBS panel to the Quantum™ HD through RS-4845 communications.
- **CT** – Read the Motor Amps through an optionally connected and configured CT (Current Transformer). This CT, if provided, will be located on channel 16 of analog board 1.

DBS Comms - When communications from the Quantum™ HD to the DBS starter is funciotning normally, the software version of the DBS panel will be shown here. A value of zero (0) indicates that there is no communications.

At the bottom of this screen is a button labeled as **[Load Factory Defaults]**. Selecting this button will cause the above listed setpoint values to be re-written with the original factory setpoints. These setpoints are sent from the DBS panel via communications into the Quantum™ HD.

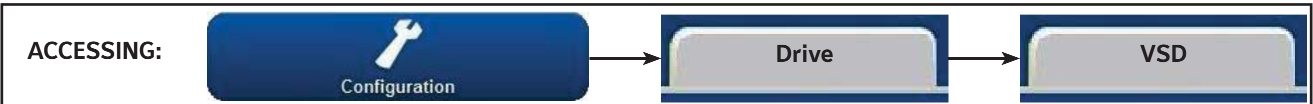
NOTE: Contact Schneider Electric at 800-220-8697 with any further questions concerning the setup and operation of the RAM DBS.



CONFIGURATION

Drive - VSD





DESCRIPTION: Use this screen to set the specific Drive safeties information for a VSD (Variable Speed Drive) motor starter. These safeties are important for the safe operation of the compressor and motor.

BASICS OF VFD OPERATION

Relying on user input as well as system pressures and temperatures, the Quantum™ HD directs the Variable Speed Drive to start or stop the compressor and change the compressor's speed to regulate capacity. The setpoints that primarily control the operation of the VSD are found on the Quantum HD's Capacity Control Setpoints and Motor Setpoints pages.

To start the compressor, the Quantum™ HD sends a signal to the VSD to turn on the motor. When the VSD receives the start command, it turns on the motor and ramps up to the speed set by the VSD Minimum Drive Output setpoint. At the same time if the slide valve is below the Variable Speed Minimum Slide Valve Position, it immediately loads to the Variable Speed Minimum Capacity Valve Position.

As more capacity is required, the Quantum™ HD loads Capacity Slide. The Capacity Control Settings (on the Motor Setpoints page) can be configured to cause the motor speed to increase at the same time, but in most VSD applications the Capacity Control Drive Speed setpoint is set to match the Minimum Drive Output setpoint. In this configuration the motor speed will remain at its minimum speed until the slide valve loads above the Capacity Control Slide Valve setpoint. If the slide valve cannot load due to a slide valve load inhibit condition or because the compressor cannot build differential pressure, the motor speed will increase to meet the capacity requirement.

When the Capacity Slide reaches the Capacity Slide to Speed Transition setpoint, the motor speed can then increase. At this point the Capacity Slide and motor speed can continue to increase independently of one another until the capacity requirement is met or they reach their maximum values. If the compressor is in Auto mode, the motor speed is controlled by the VSD Proportional Band and VSD Integration Time setpoints.

If less capacity is required, the Quantum™ HD will first decrease the motor speed. The motor speed can drop as low as the Speed to Capacity Transition setpoint. When the motor speed reaches this point, depending on the Quantum™ HD's configuration, the Capacity Valve may unload or the Quantum™ HD may stop the compressor. If the Capacity Valve is permitted to unload, it will not unload below the Variable Speed Minimum Capacity Slide Position while the compressor is running.

DRIVE CONTROL

[Maximum Drive Output] - This setpoint represents the maximum signal to the drive from the Quantum™ HD, where 100% would represent 3600 rpm on a 3600 rpm – 60 hz motor. Selectable from 1-100% of the 4-20 mA signal.

Minimum speed is conditional based on oil, refrigerant, etc. Be certain that the Minimum Drive Output is properly identified.

[Minimum Drive Output] - This setpoint represents the minimum signal to the drive from the Quantum™ HD, where 20% would represent 720 rpm on a 3600 rpm – 60 hz motor. Selectable from 1-100% of the 4-20 mA signal.

Calculated Minimum Drive Output

Capacity Slide To Speed Transition – The first setpoint in the Capacity Control section [95%] is the slide valve position at which the speed will be allowed to increase to maintain the capacity control setpoint. It also represents the slide valve position of which the speed will increase proportionally to the value of the second setpoint [50%] from the Minimum Output setpoint. If the second setpoint, also known as the Speed to Capacity Slide Proportion setpoint was set at [50%] the speed would increase proportionally from the Minimum Drive Output setpoint [20%] to [50%] as the slide valve loads from 0% to 95%. In this case, that would be an increase of approximately 1% speed to every 3% slide valve.

Speed To Capacity Slide Proportion - The speed at which the Slide Valve will load.

VFD Minimum Capacity Slide Position - (100% Maximum Drive Output - Minimum Drive Output %)/2. For example:

Maximum Drive Output is 100%, Minimum Drive Output is 20%, then the Minimum Slide Valve Output would be 40%:

(100-20)/2 -40

NOTE: The Absolute Minimum RPM is 720.

Recycle Delay Control - Set this to disabled if you do not want to utilize the Recycle Delay feature. Enable it to use it.

- Disabled
- Enabled

REMOTE SPEED CONTROL

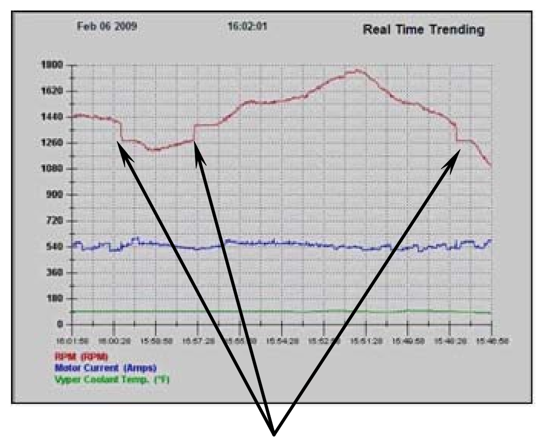
Provided For backward compatibility to older control systems if necessary. Preferred method of control is by the Quantum HD.

- **[Rate of Increase]** - The rate of speed increase over the duration of the Delay setpoint when either a serial load command is received or a digital load signal is received.
- **[Rate of Decrease]** - The rate of speed decrease over the duration of the Delay setpoint when either a serial unload command is received or a digital unload signal is received. This also sets the rate at which the panel will cause a Force Unload for high or low pressure and separator velocity. For Force Unloading the Rate Of Decrease is two times the value of the setpoint.

SKIP FREQUENCY BANDS

Skip Frequency Bands - These setpoints provide the ability to lockout 5 frequency bands where abnormal noise may occur due to the resonance of various components throughout the speed range. The slide valve needs to be at 100% when the speed range is run through to detect these bands. The limit is 5% from bottom to the top of each band lockout.

During drive ramp up, these bands will be skipped.

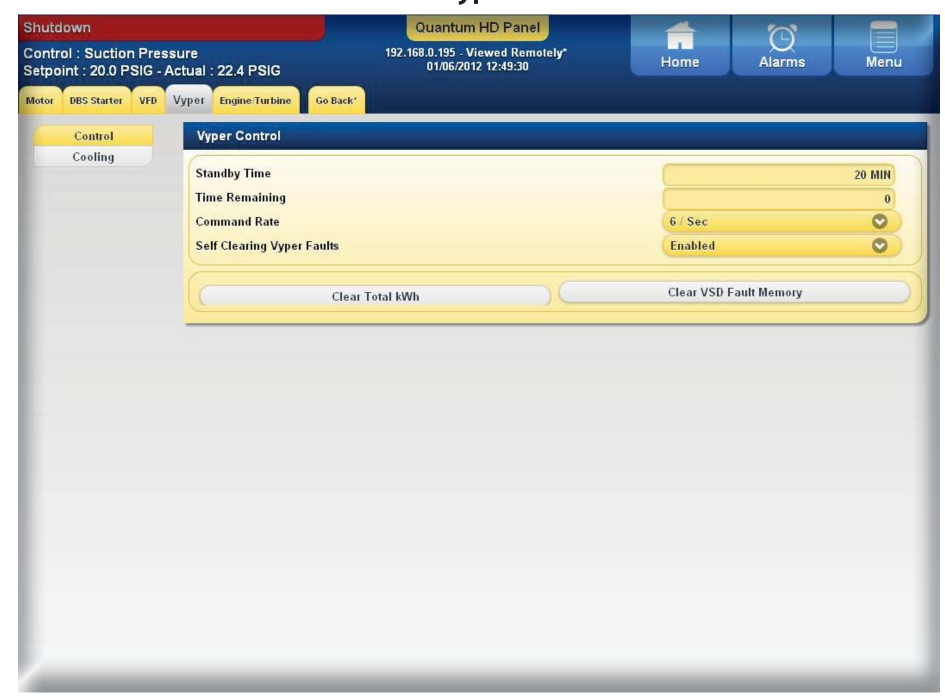


Defined frequency SKIP areas

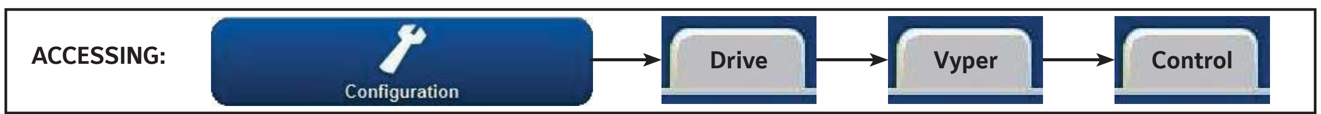


CONFIGURATION

Drive - Vyper Control



ACCESSING:



DESCRIPTION: Use this screen to set the specific Drive safeties information for a Vyper motor starter. These safeties are important for the safe operation of the compressor and motor.

VYPER CONTROL

Standby Time - The amount of time after the compressor is stopped that the Vyper will keep the DC Bus charged to quickly react to Start commands.

Time Remaining - The time remaining for standby time once the standby time expires, allowing the DC Bus to discharge.

Command Rate - The frequency of communications per second.
Self Clearing Vyper Faults - Many Vyper faults are self-clearing. If the Self-Clearing Faults has been enabled, the Vyper can clear faults and be re-started if needed.

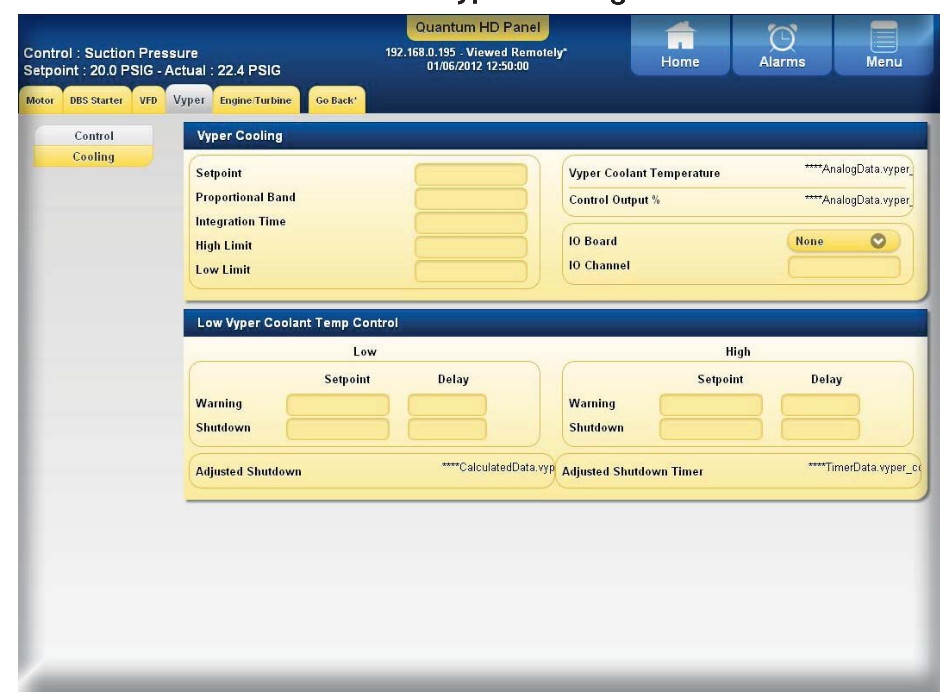
- **Disabled**
- **Enabled**

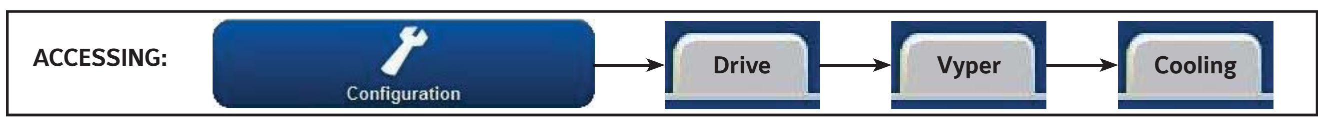
Clear Total kWh - Clears the total KiloWatt hours accurued by the Vyper.

Clear VSD Fault Memory - Clears the VSD fault memory.

CONFIGURATION

Drive - Vyper Cooling





DESCRIPTION: Use this screen to set the specific Drive safeties information for a Vyper motor starter. These safeties are important for the safe operation of the compressor and motor.

VYPER COOLING

Setpoint - Enter the value that you wish to control to.

Proportional Band - This setpoint determines the size of a region either above or below the Setpoint. Within this region, the Proportional component of the Output value is the number between 0% and 100% that directly corresponds to the difference between the Vyper Coolant Temperature (Actual) and the Setpoint. Outside of this region, the Proportional component is either 100% or 0%.

Integration Time - This setpoint controls the influence that the Integral component exerts on the Output value. The Integral component works to push the Vyper Coolant Temperature toward the Setpoint by tracking the difference between the temperature and the Setpoint over time.

High Limit - The highest value that the output can be.

Low Limit- The lowest value that the output can be.
Vyper Coolant Temperature - The actual reading of the Vyper Coolant Temperature.

Control Output % - The actual value that is being output to control the temperature.

I/O Board - Three selections are provided:

- **None** - No board selected.
- **Digital Board 1** - The Output to be controlled is located on Digital Board 1.
- **Digital Board 2** - The Output to be controlled is located on Digital Board 2.

I/O Channel - Enter the channel of the selected Digital Board to control (1 - 24).

LOW VYPER COOLANT TEMP CONTROL

Low Warning Setpoint - If the Vyper Coolant temperature is less than or equal to this setpoint for the amount of time as set for the Low Warning Delay, then a Warning is issued.

Low Warning Delay - The time period as set here will begin to time down if the Vyper Coolant temperature is less than or equal to the Low Warning Setpoint, and remains below or equal. When this delay times out, a Warning will be issued.

Low Shutdown Setpoint - If the Vyper Coolant temperature is less than or equal to this setpoint for the amount of time as set for the Low Shutdown Delay,



then a Warning is issued.

Low Shutdown Delay - The time period as set here will begin to time down if the Vyper Coolant temperature is less than or equal to the Low Shutdown Setpoint, and remains below or equal. When this delay times out, a Shutdown will be issued.

High Warning Setpoint - If the Vyper Coolant temperature is greater than or equal to this setpoint for the amount of time as set for the High Warning Delay, then a Warning is issued.

High Warning Delay- The time period as set here will begin to time down if the Vyper Coolant temperature is greater than or equal to the High Warning Setpoint, and remains greater or equal. When this delay times out, a Warning will be issued.

High Shutdown Setpoint - If the Vyper Coolant temperature is greater than or equal to this setpoint for the amount of time as set for the High Shutdown Delay, then a Shutdown is issued.

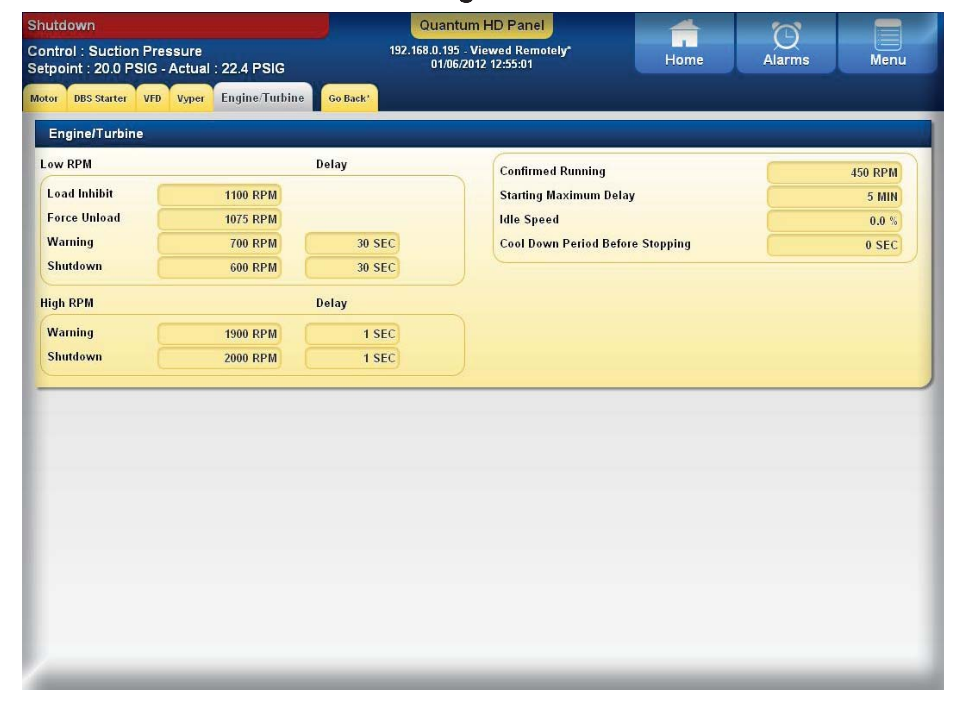
High Shutdown Delay - The time period as set here will begin to time down if the Vyper Coolant temperature is greater than or equal to the High Shutdown Setpoint, and remains greater or equal. When this delay times out, a Shutdown will be issued.

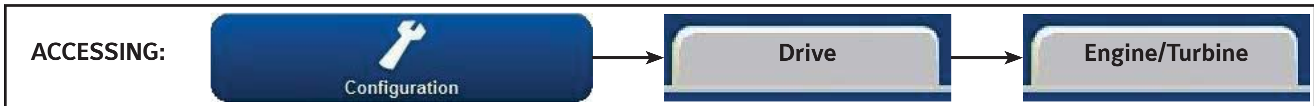
Adjusted Shutdown - On Start-up, the Low Vyper Coolant Alarm and Shutdown are set to the Current Vyper Coolant Temperature plus 5 degrees F.

Adjusted Shutdown Timer - Once the Adjusted Shutdown timer (30 minutes) expires, the Low Vyper Coolant Warning and Shutdown settings return to the pre-start setpoints.

CONFIGURATION

Drive - Engine / Turbine





DESCRIPTION: Use this screen to set the specific Drive safeties information for an Engine/Turbine motor starter. These safeties are important for the safe operation of the compressor and motor.

ENGINE/TURBINE

Low RPM

Load Inhibit - The compressor slide valve will be prevented from loading until the RPM's are less than this setpoint.

Force Unload - When the RPM's are greater than or equal to this setpoint, the compressor Slide Valve will be forced to unload.

Warning - If the RPM's are less than or equal to this setpoint, for the warning time delay, a warning occurs.

Warning Delay - The minimum time in seconds that the RPM's are less than or equal to the Low RPM Warning setpoint before notification of the warning.

Shutdown - If the RPM's are less than or equal to this setpoint, for the shutdown time delay, the compressor will shut down.

Shutdown Delay - The minimum time in seconds that the RPM's are less than or equal to the Low RPM Shutdown setpoint before the compressor will shut down.

High RPM

Warning - If the RPM's are greater than or equal to this setpoint, for the warning time delay, a warning occurs

Warning Delay - The minimum time in seconds that the RPM's are greater than or equal to the Low RPM Warning setpoint before notification of the warning.

Shutdown - If the RPM's are greater than or equal to this setpoint, for the shutdown time delay, the compressor will shut down.

Shutdown Delay - The minimum time in seconds that the RPM's are greater than or equal to the Low RPM Shutdown setpoint before the compressor will shut down.

Confirmed Running - The measured RPM's must be greater than or equal to this setpoint before the compressor will transition from Starting to Running.

Starting Maximum Delay – After the compressor is commanded to start, this setpoint indicates the period during which the High RPM's Load Inhibit and Force Unload checks are not performed.

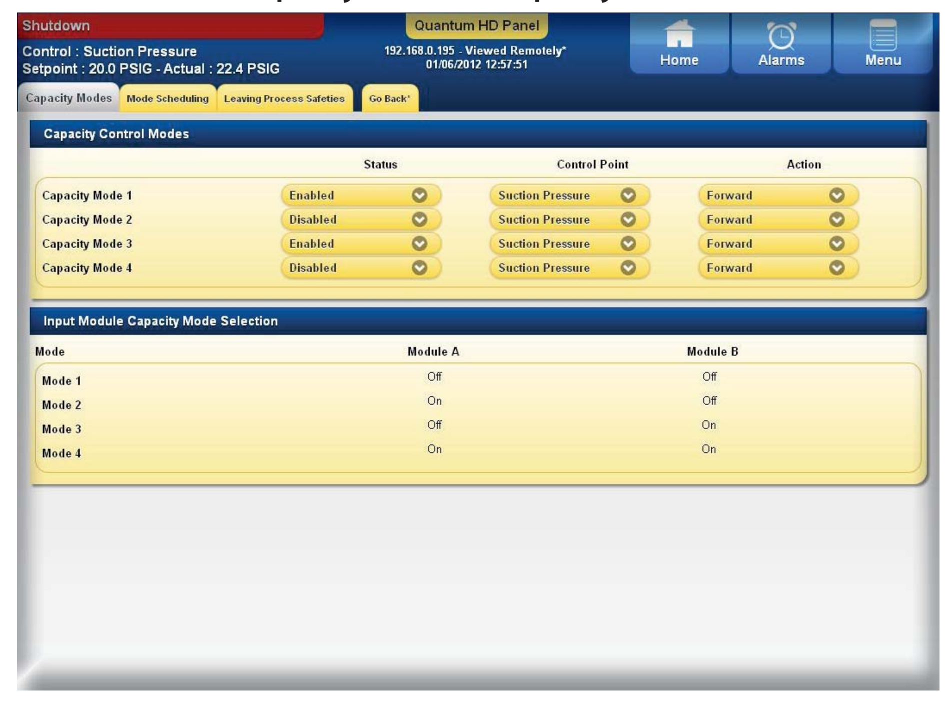
Idle Speed

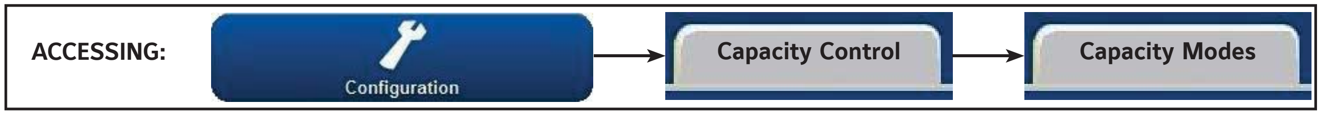
Cool Down Period Before Stopping



CONFIGURATION

Capacity Control - Capacity Modes





DESCRIPTION: Use this screen to set the Capacity Control Modes.

CAPACITY CONTROL MODES

[Status] - A pull down menu is provided to select from the following:

- **Disabled**
- **Enabled**

[Control Point] - A pull down menu is provided to select from the following:

- Suction Pressure
- Discharge Pressure
- Economizer Pressure
- System Discharge Pressure
- Suction Temperature
- Discharge Temperature
- Process/Brine Temperature Leaving
- Process/Brine Temperature Entering
- Auxiliary 1 thru 10

[Action]

- **Forward** – As the Capacity Control value drops below the capacity control setpoint, these setpoints will protect the compressor by decreasing the capacity, or if necessary shutting down the compressor.
- **Reverse** - As the Capacity Control value rises above the capacity control setpoint, these setpoints will protect the compressor by decreasing the capacity, or if necessary shutting down the compressor.

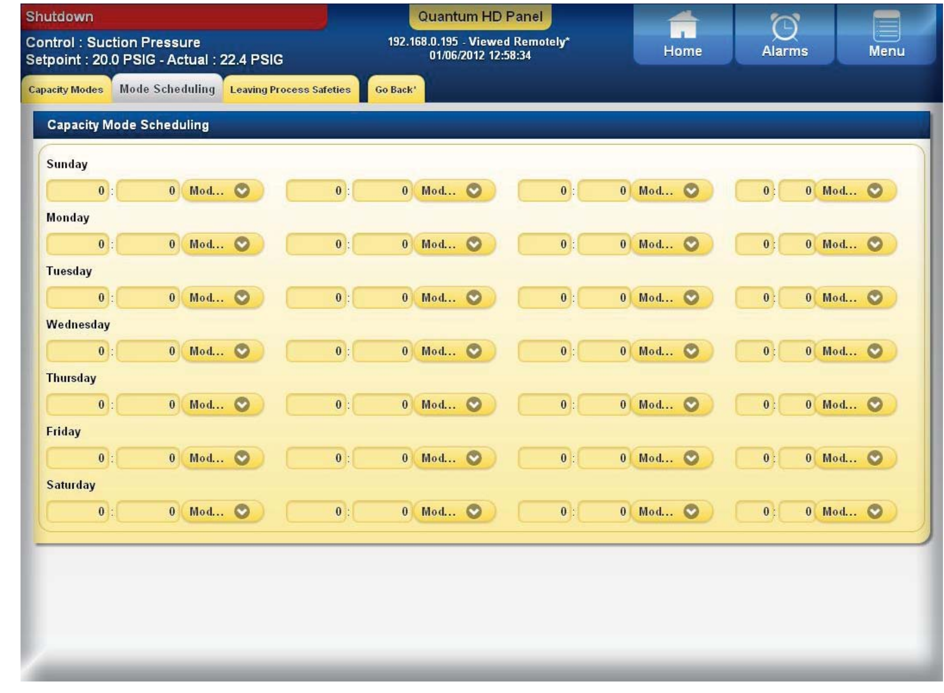
INPUT MODULE CAPACITY MODE SELECTION

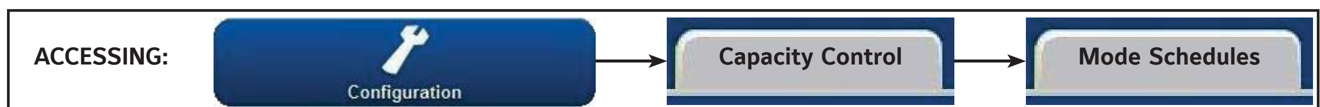
This provides for selecting the Capacity Control via the two input modules rather than the keypad or communications port. The mode that will be selected can be derived from the following matrix:

Mode	Module A	Module B
Mode 1	Off	Off
Mode 2	On	Off
Mode 3	Off	On
Mode 4	On	On

CONFIGURATION

Capacity Control - Mode Scheduling





DESCRIPTION: Scheduling allows the user to program up to four different operating schedules for each day of the week. This can be a great way to save energy. At night or on week-ends and holidays, or even over lunch periods when room doors are kept closed or production is minimized, a higher temperature can be set to reduce energy consumption.

CAPACITY MODE SCHEDULING

This screen shows a time schedule. Up to four different modes can be entered for each day of the week.

Notice that there are four columns of Hour/Minute entries, each followed by a Mode (1 - 4). Use the left most column (on the row for the day of the week that you wish to schedule) to enter the time of day that you would like the compressor to switch form it's normal operating mode, into the scheduled mode. When that time of day arrives, whatever mode the compressor WAS running in, will be switched over to the scheduled (Mode 1 -4) mode. This mode will then be the active running mode, and will continue to be the active mode until the time in the following column is reached. If the time in the next column is 00:00, it will be skipped.

The Schedule must be activated to switch the presently active Mode to the Scheduling mode at the assigned time. An entry of 00:00 will void the time entry field. If setback is required at midnight (00:00) use 00:01.

The following are descriptions of the setpoints:

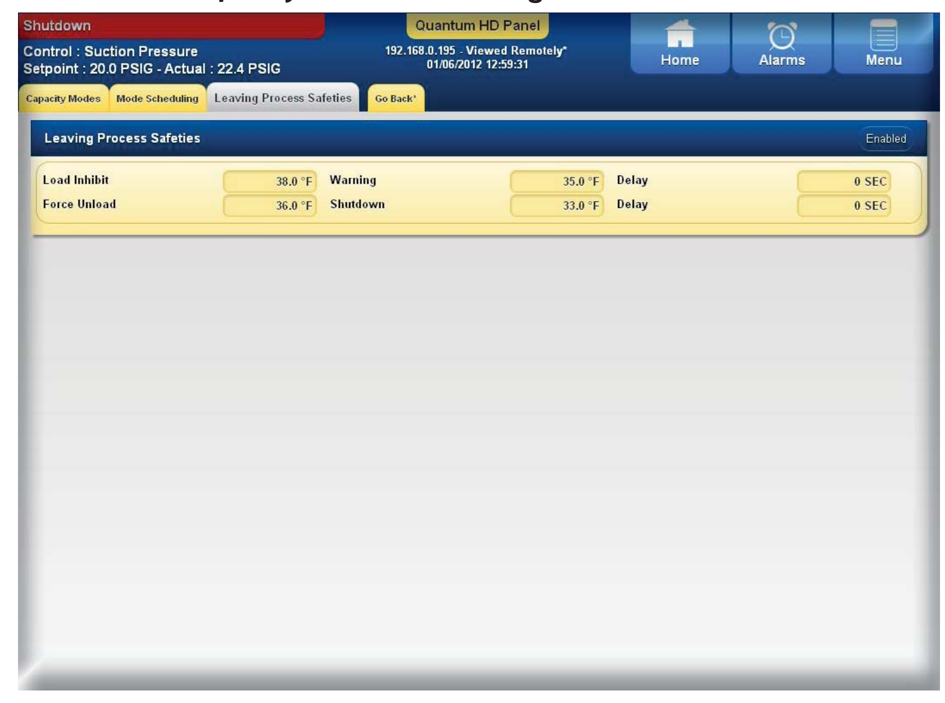
Time Column - The time of day that you want to switch to the Scheduled regulation setpoints of the active capacity control.

Mode Column - Set this to the Mode (1 - 4) that you want to run at the assigned time.

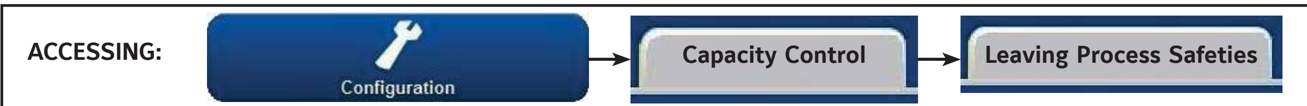


CONFIGURATION

Capacity Control - Leaving Process Safeties



ACCESSING:



DESCRIPTION: Use this screen to set the Leaving Process Safeties.

LEAVING PROCESS SAFETIES

- **Disabled**
- **Enabled**

The following setpoint boxes are provided:

Load Inhibit

- **Warning** - If the Leaving Process Temperature greater than or equal to this setpoint, for the warning time delay, a warning occurs.
- **Delay** - This is the delay period for the Load Inhibit Warning.

Force Unload

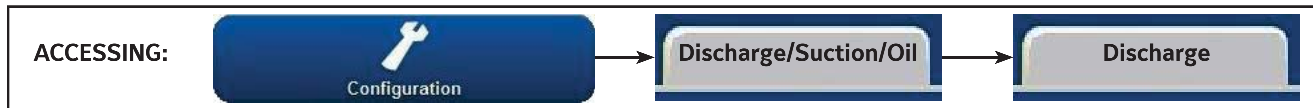
- **Warning** - If the Leaving Process Temperature is greater than or equal to this setpoint, for the alarm time delay, a warning occurs.
- **Delay** - This is the delay period for the Force Unload Warning.

CONFIGURATION

Discharge / Suction / Oil - Discharge



ACCESSING:



DESCRIPTION: Use this screen to set the Discharge pressure and temperature Safeties.

HIGH DISCHARGE PRESSURE

The following setpoint boxes are provided:

- **[Load Inhibit]** - The compressor Slide Valve will be prevented from loading until the Discharge Pressure is less than this setpoint.
- **[Force Unload]** - When the Discharge Pressure is greater than or equal to this setpoint, the compressor Slide Valve will be forced to Unload.
- **[Warning and delay]** - If the Discharge Pressure is greater than or equal to this setpoint, for the warning time delay, a warning occurs.
- **[Shutdown and delay]** - If the Discharge Pressure is greater than or equal to this setpoint, for the shutdown time delay, the compressor will be shut down.

HIGH DISCHARGE TEMPERATURE

The following setpoint boxes are provided:

- **[Load Inhibit]** – The compressor Slide Valve will be prevented from loading until the Discharge Temperature is less than this setpoint.
- **[Force Unload]** – When the Discharge Temperature is greater than or equal to this setpoint, the compressor Slide Valve will be forced to Unload.
- **[Warning and delay]** - If the Discharge Temperature is greater than or equal to this setpoint, for the alarm time delay, a warning occurs.
- **[Shutdown and delay]** - If the Discharge Temperature is greater than or equal to this setpoint, for the shutdown time delay, the compressor will shut down.

LOW DISCHARGE PRESSURE CONTROL

The following setpoint boxes are provided:

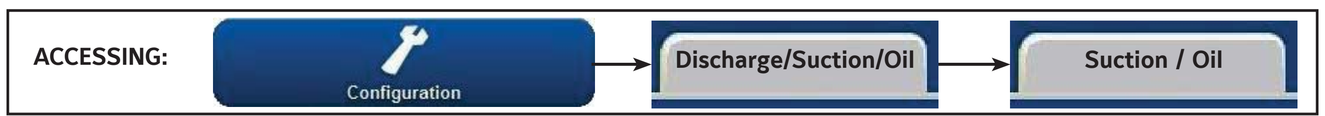
- **[Shutdown and Delay]** – If the Discharge Pressure is less than or equal to the Low Discharge Pressure Shutdown setpoint for its time delay, the compressor will shutdown.
- **[Startup Ignore Delay]** - Ignores safety logic after Startup for the Delay setting.



CONFIGURATION

Discharge / Suction / Oil - Suction / Oil





DESCRIPTION: Use this screen to set the pressure and temperature Safeties.

PRESSURE SAFETIES

High Suction Pressure

The following setpoint boxes are provided:

- **[Load Inhibit]** - The compressor Slide Valve will be prevented from loading until the Suction Pressure is less than this setpoint.
- **[Force Unload]** - When the Suction Pressure is greater than or equal to this setpoint, the compressor Slide Valve will be forced to Unload.
- **[Warning and delay]** - If the Suction Pressure is greater than or equal to this setpoint for the warning delay, a warning occurs.
- **[Shutdown and delay]** - If the Suction Pressure is greater than or equal to this setpoint for the shutdown delay, the compressor will be shut down.

High Filter Pressure

The following setpoint boxes are provided:

- **[Warning]** - If the Filter Pressure is greater than or equal to this setpoint for the warning delay, a warning occurs.
- **[Warning Delay]** - The minimum time in seconds that the Filter Pressure is greater than or equal to the High Filter Pressure Warning setpoint before the warning occurs.
- **[Shutdown]** - If the Filter Pressure is greater than or equal to this setpoint for the shutdown delay, the compressor will shut down.
- **[Shutdown Delay**] - The minimum time in seconds that the Filter Pressure is greater than or equal to the High Filter Pressure Shutdown setpoint before the compressor will shut down.

High Compressor Oil Pressure

- **Disabled**
- **Enabled**

The following setpoint boxes are provided:

- **[Shutdown]** – If the High Compressor Oil Pressure is enabled and the Oil Pressure is greater than or equal to this setpoint for the shutdown delay, the compressor will shut down.
    - **[Shutdown Delay]** – The minimum time in seconds that the Oil Pressure is greater than or equal to the High Compressor Oil Pressure Shutdown setpoint before the compressor will shut down.

TEMPERATURE SAFETIES

Low Oil Separator Temperature

The following setpoint boxes are provided:

- **[Warning]** – If the Oil Separator Temperature is less than or equal to this setpoint for the warning delay, a warning occurs.
    - **[Warning Delay]** – The minimum time in seconds that the Oil Separator Temperature is less than or equal to the Low Oil Separator Temperature Warning setpoint before notification of the warning.
- **[Shutdown]** – If the Oil Separator Temperature is less than or equal to this setpoint for the shutdown time delay, the compressor will shut down.
    - **[Shutdown Delay]** – The minimum time in seconds that the Oil Separator Temperature is less than or equal to the Low Oil Separator Shutdown setpoint before the compressor will shut down.

Low Comp. Oil Temperature

The following setpoint boxes are provided:

- **[Warning]** – If the Oil Temperature is less than or equal to this setpoint for the warning delay, a warning occurs.
    - **[Warning Delay]** – The minimum time in seconds that the Oil Temperature is less than or equal to the Low Oil Warning setpoint before notification of the warning.
- **[Shutdown]** – If the Oil Temperature is less than or equal to this setpoint for the shutdown time delay, the compressor will shut down.
    - **[Shutdown Delay]** – The minimum time in seconds that the Oil Temperature is less than or equal to the Low Oil Shutdown setpoint before the compressor will shut down.

Low Oil Pressure

The following setpoint boxes are provided:

- **[Warning]** – If the Oil Pressure is less than or equal to this setpoint for the warning delay, a warning occurs.
    - **[Warning Delay]** – The minimum time in seconds that the Oil Pressure is less than or equal to the Low Oil Pressure Warning setpoint before notification of the warning.
- **[Shutdown]** – If the Oil Pressure is less than or equal to this setpoint for the shutdown delay, the compressor will shut down.
    - **[Shutdown Delay]** – The minimum time in seconds that the Oil Pressure is less than or equal to the Low Oil Pressure Shutdown setpoint before the compressor will shut down.

High Oil Temperature

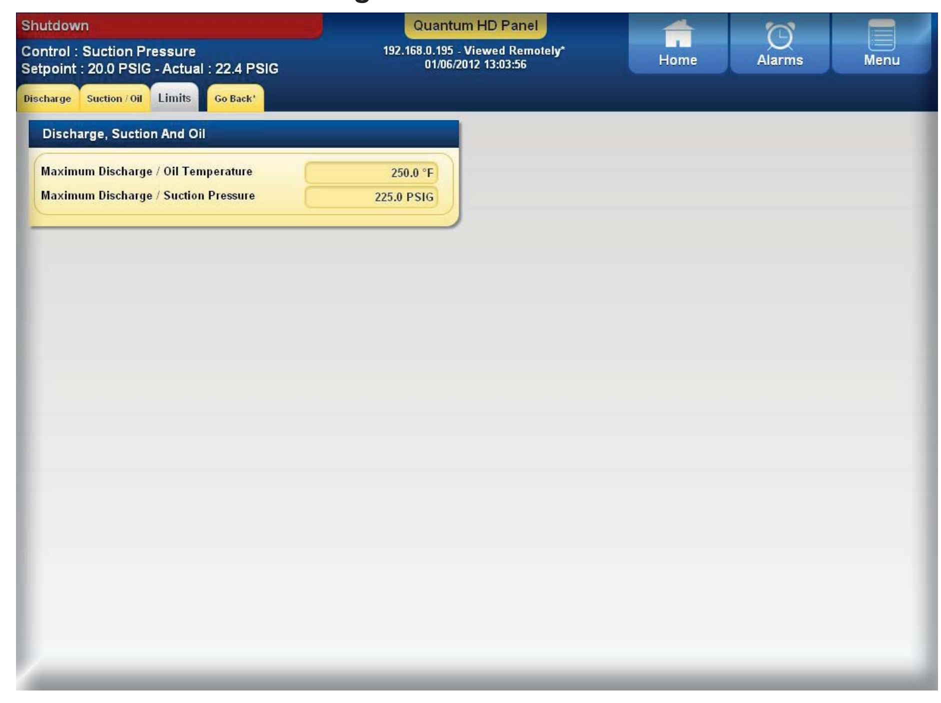
The following setpoint boxes are provided:

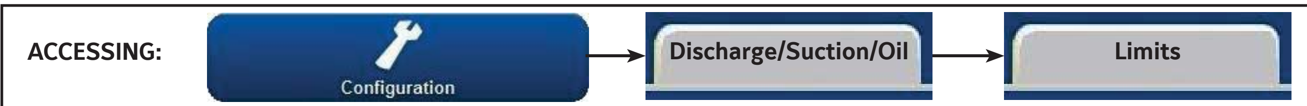
- **[Warning]** – If the Oil Temperature is greater than or equal to this setpoint for the warning delay, a warning occurs.
    - **[Warning Delay]** – The minimum time in seconds that the Oil Temperature is greater than or equal to the High Oil Temperature Warning setpoint before notification of the warning.
- **[Shutdown]** – If the Oil Temperature is greater than or equal to this setpoint for the shutdown delay, the compressor will shut down.
    - **[Shutdown Delay]** – The minimum time in seconds that the Oil Temperature is greater than or equal to the High Oil Temperature Shutdown setpoint before the compressor will shut down.



CONFIGURATION

Discharge / Suction / Oil - Limits





DESCRIPTION: Use this screen to set the pressure and temperature limits.

DISCHARGE, SUCTION AND OIL

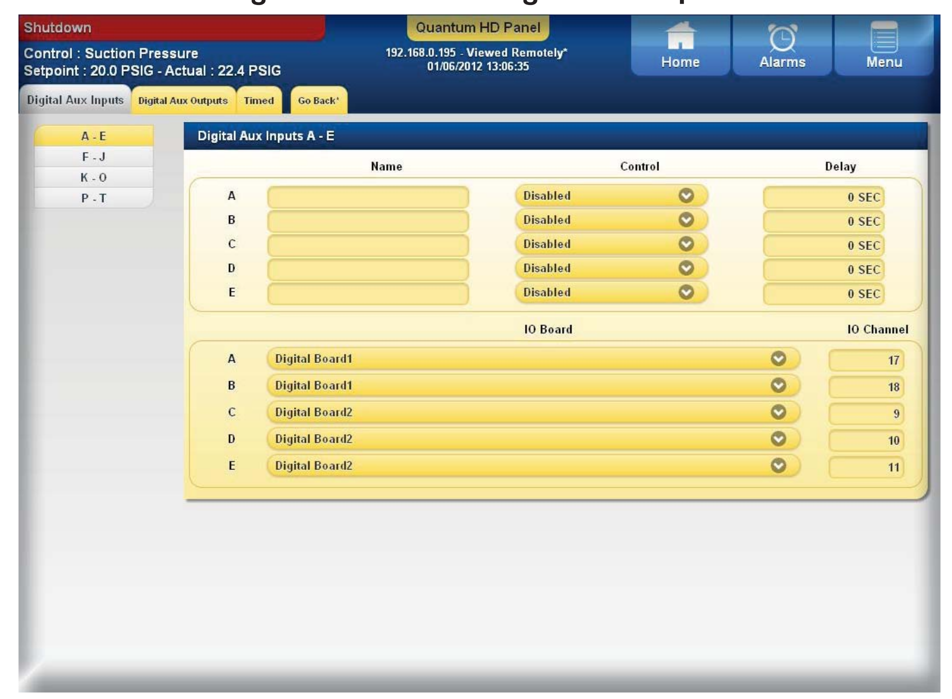
The following setpoint boxes are provided:

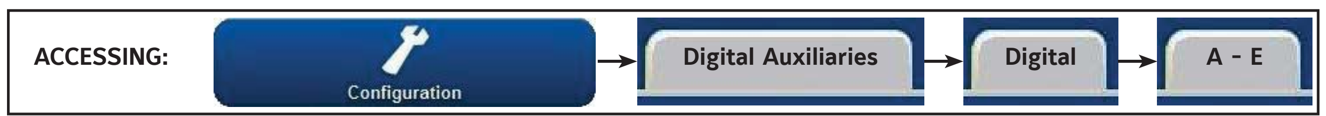
Maximum Discharge / Oil Temperature - Enter the value here to set the maximum Discharge, Suction and Oil temperature limits.

Maximum Discharge / Suction Pressure - Enter the value here to set the maximum Discharge and Suction Pressure limits.

CONFIGURATION

Digital Auxiliaries - Digital Aux Inputs





DESCRIPTION: These screens are used to view and set the Auxiliary Digital Input values. It is also used to custom name each of the Auxiliary Digital channels. The screen information provided below applies to all Digital Aux. Input screens.

Use this screen to setup an Auxiliary Digital Input to be used to generate a warning or a shutdown whenever the associated input is not energized (off). As an example:

If Auxiliary Input 1 is set to Shutdown When Running, and the Delay is set to 10 seconds, then whenever the device that is physically attached to I/O Channel 17 (Digital Board 1) becomes de-energized (turns off) AND the unit is Running, then the delay timer will start to count down. When the Delay times out, a shutdown message is issued (Auxiliary Input 1 Shutdown), and the unit will stop running.

DIGITAL AUX. INPUTS A-E

Name - The user may enter a custom name for each Input here.

Control

- **Disabled** - The device will not be monitored for warnings or shutdowns.
- **Shutdown When Starting/Running** - The device will be monitored for shutdown occurrences only while the compressor is transitioning from the starting state to the running state.
- **Shutdown When Running** - The device will be monitored for shutdown occurrences only after the compressor enters the running state.
- **Shutdown Always** - The device will be monitored for shutdown occurrences all of the time.
- **Warning When Starting/Running** - The device will be monitored for warning occurrences only while the compressor is transitioning from the starting state to the running state.
- **Warning When Running** - The device will be monitored for warning occurrences only after the compressor enters the running state.
- **Warning Always** - The device will be monitored for warning occurrences all of the time.

Delay - This value specifies the duration that the digital signal must remain off before a warning or shutdown is issued.

I/O Board - Three selections are provided:

- **None** - No board selected.

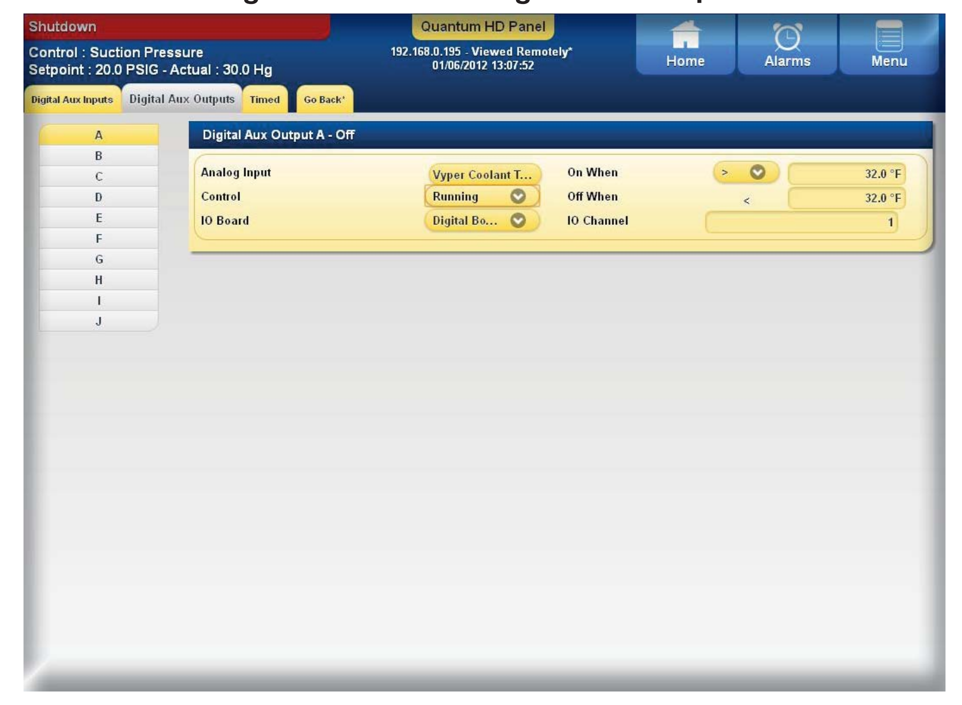


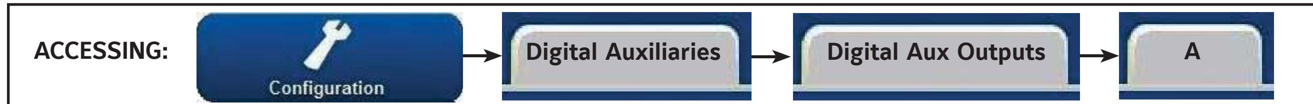
- **Digital Board 1** - The Output to be controlled is located on Digital Board 1.
- **Digital Board 2** - The Output to be controlled is located on Digital Board 2.

I/O Channel - Enter the channel of the selected Digital Board to control (1 - 24).

CONFIGURATION

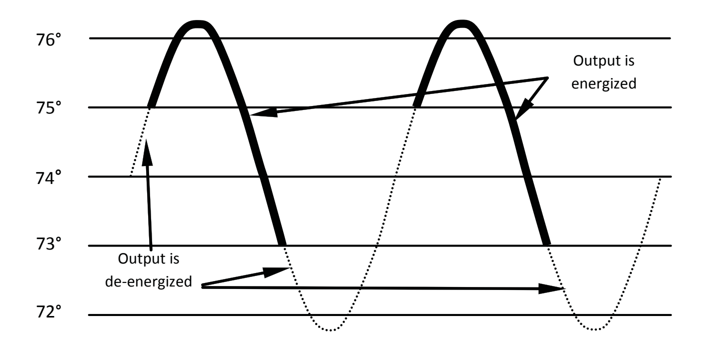
Digital Auxiliaries - Digital Aux Outputs





DESCRIPTION: Use these screens (Digital Aux. Output A - J) to setup and control an Auxiliary Digital Output using the signal from an Analog Input. The following descriptions apply to all Digital Aux. Output pages.

The graphic below illustrates one scenario in which an analog Temperature input is used to drive a digital output. When the temperature exceeds the On When value of 75°, the output will energize. It will remain in this state until the analog input falls below the Off When value of 73°. This state will persist until the input again exceeds the On When value. The resulting temperature control would resemble the following sine wave:



DIGITAL AUX. OUTPUT A - (Off or On status shown)

Analog Input

- Capacity Slide Position
- Volume Slide Position
- Suction Pressure
- Discharge Pressure
- Compressor Oil Pressure
- Main Oil Injection Pressure
- Economizer Pressure
- Filter Pressure
- Intermediate Pressure
- Balance Piston Pressure
- System Discharge Pressure
- Suction Temperature
- Discharge Temperature
- Compressor Oil Temperature
- Oil Separator Temperature
- Process/Brine Temperature Leaving
- Process/Brine Temperature Entering
- Remote Control Setpoint
- Motor Current
- RPM
- User defined analog inputs #1 - #20
- User defined analog inputs #12 - #20
- Manifold Pressure
- Remote Capacity Position
- Compressor Vibration – Suction
- Compressor Vibration – Discharge
- Motor Vibration – Shaft Side
- Motor Vibration – Opposite Shaft Side



- Motor Temperature – Shaft Side
- Motor Temperature – Opposite Shaft Side
- Motor Stator #1 - #3
- Vyper Coolant Temperature

Control

- **Disabled** - The output will be disabled.
- **Running** - The output is controlled while the compressor is running.
- **Always** - The output is controlled always.

I/O Board - Three selections are provided:

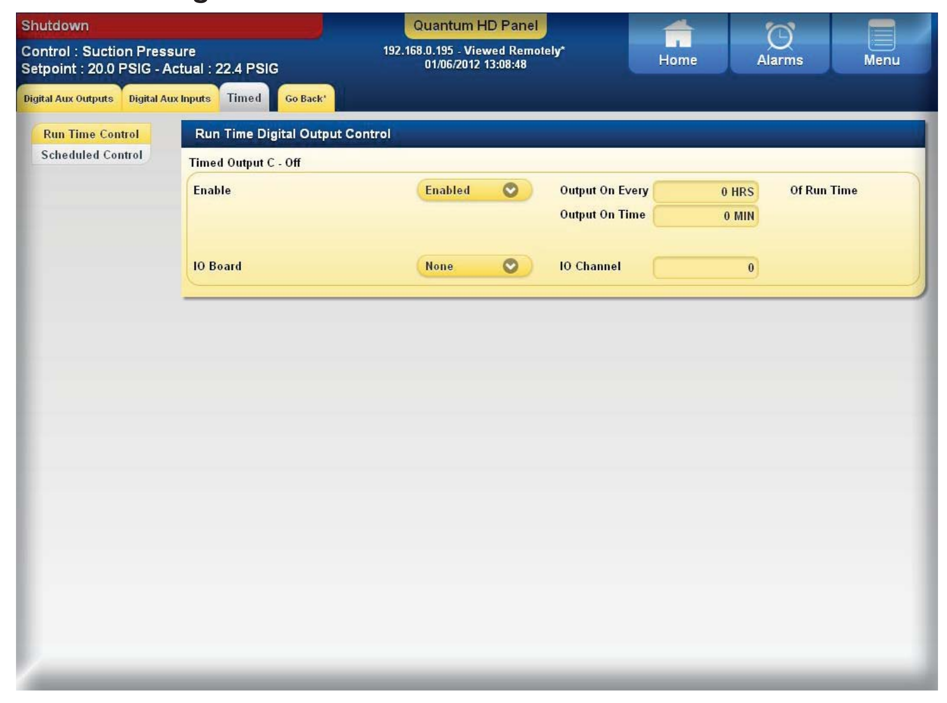
- **None** - No board selected.
- **Digital Board 1** - The Output to be controlled is located on Digital Board 1.
- **Digital Board 2** - The Output to be controlled is located on Digital Board 2.

On/Off When – When operating in the (>) mode, the digital output will be de-energized when the analog signal falls below the Off When value, and will remain off until the input rises above the On When value. Similarly, when operating in the (<) mode, the digital output will be de-energized when the input signal exceeds the Off When value and re-energized when the analog signal falls below On When value.

I/O Channel - Enter the channel of the selected Digital Board to control (1 - 24).

CONFIGURATION

Digital Auxiliaries - Timed - Run Time Control





DESCRIPTION: This screen may be used to assign a digital output to run based on the Compressor Run time.

RUN TIME DIGITAL OUTPUT CONTROL

Timed Output C - (Off or On status shown)

Enable

- **Disable** - Output C will not be enabled.
- **Enable** - Output C will turn on after the Output On times have been met.

I/O Board - Three selections are provided:

- **None** - No board selected.
- **Digital Board 1** - The Output to be controlled is located on Digital Board 1.
- **Digital Board 2** - The Output to be controlled is located on Digital Board 2.

Output On Every - The number of hours after the Compressor has been running, before the Output will energize.

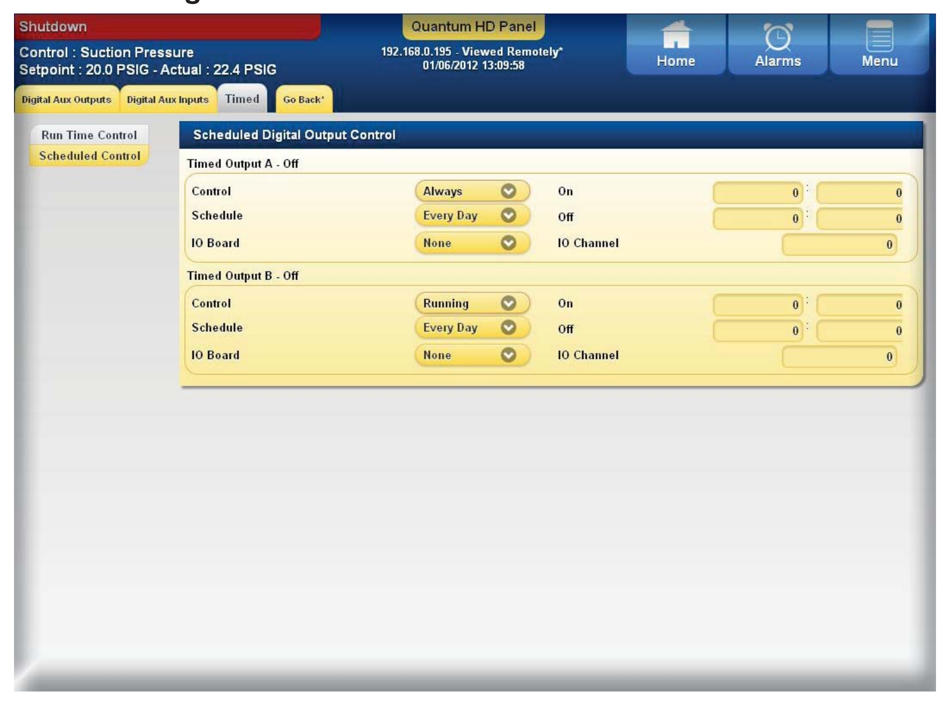
Output On Time - The length of time that the Output will be energized once the Run Hour Interval has been satisfied.

I/O Channel - Enter the channel of the selected Digital Board to control (1 - 24).



CONFIGURATION

Digital Auxiliaries - Timed - Scheduled Control





DESCRIPTION: This screen may be used to custom assign up to two available digital outputs (A & B) to a timed schedule:

SCHEDULED DIGITAL OUTPUT CONTROL

Timed Output A - (Off or On status shown)

NOTE: This section is identical for Timed Output B also.

Control - Three choices are provided:

- **Disabled** - Output will never energize (under timed control).
- **Running** - Output will only be controlled while the Compressor is Running.
- **Always** - The Output will be controlled all of the time.

Schedule - Two selections are provided:

- **Every Day** - The Output will be controlled seven days a week.
- **Week Days** - The Output will be controlled Monday through Friday only.

I/O Board - Three selections are provided:

- **None** - No board selected.
- **Digital Board 1** - The Output to be controlled is located on Digital Board 1.
- **Digital Board 2** - The Output to be controlled is located on Digital Board 2.

The following setpoint boxes and drop down menus are available for Outputs A and B:

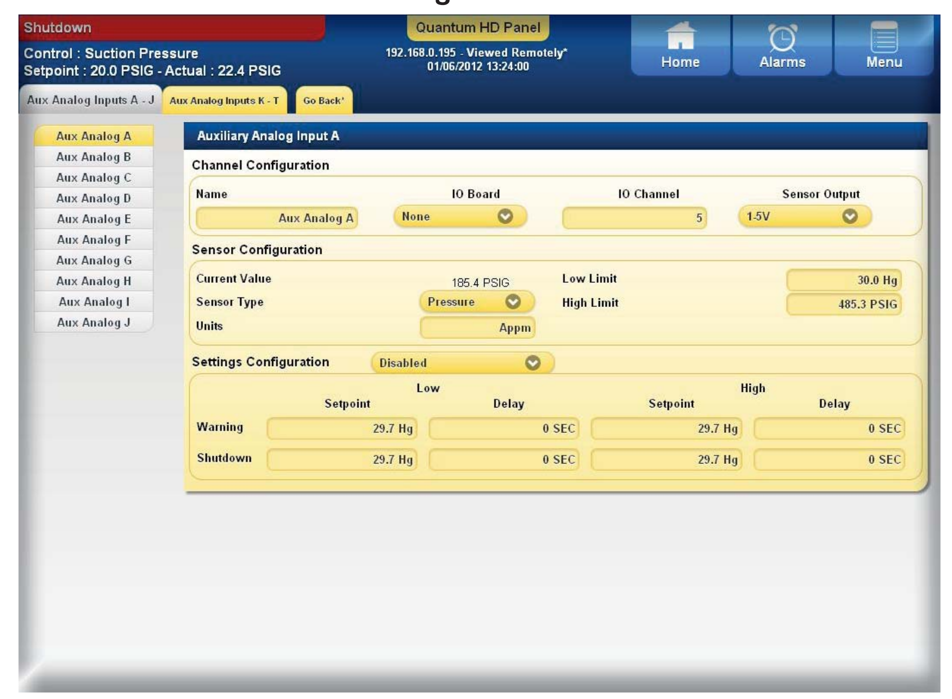
On - Enter into these setpoint boxes the actual time of day that you want the Output to energize.

Off - Enter into these setpoint boxes the actual time of day that you want the Output to de-energize.

I/O Channel - Enter the channel of the selected Digital Board to control (1 - 24).

CONFIGURATION

Analog Auxiliaries





DESCRIPTION: These screens are used to allow the user to set the operating safeties of Auxiliary Analog inputs A through J. The descriptions that follow also apply to the Auxiliary Analog Input K - T screens also:

CHANNEL CONFIGURATION

The following pop-up menus and setpoint boxes are provided:

Name - Select this button to enter a custom name.

[I/O Board] - The following selections are provided:

- None
- Analog Bd 1
- Analog Bd 2

[I/O Channel] - A setpoint entry box is provided to select the analog board output channel that you wish to use.

[Sensor Output] - The following selections are provided:

- 0-5V
- 1-5V
- 4-20mA
- ICTD
- 0-20mA
- 0-10V
- 2-10V

SENSOR CONFIGURATION

Current Value - This is the actual value being read from the sensor at this channel. This is strictly a displayed value, and cannot be changed here.

Sensor Type - Select this button to choose the type of function this sensor is to provide, from the pop-up menu:

- None
- Pressure
- Temperature
- Other (see Units, below)

Units - If the Sensor Type is set to Other (above), then the applicable Units for the type of sensor may be entered here. For example, if the Sensor type is for measuring humidity, select Other for the sensor type, and enter a percent symbol (%) for Units.

Low Limit- This will show the low end range that the sensor is capable of reading.

High Limit - This will show the high end range that the sensor is capable of reading.



SETTINGS CONFIGURATION

Settings Configuration - A pop-up box is provided to select between the following:

- **Disabled** – The auxiliary channel will not be monitored for warnings or shutdowns.
- **When Running** - The auxiliary channel will be monitored for warning and shutdown occurrences only when the compressor is in the run state.
- **Always** - The auxiliary channel will be monitored for warning and shutdown occurrences at all times (Running or not).

The following setpoints are provided for each Auxiliary Analog channel:

[Low Warning Setpoint] – This setpoint specifies the Low Warning alarm threshold. In the event that the associated auxiliary analog input falls below this value for a period of time exceeding the Low Warning Delay, an Auxiliary Low Warning will be issued.

[Low Warning Delay] – This setpoint specifies the period of time that the associated auxiliary analog input must remain below the Low Warning Setpoint before an Auxiliary Low Warning will be issued.

[Low Shutdown Setpoint] – This setpoint specifies the Low Shutdown threshold. In the event that the associated auxiliary analog input falls below this value for a period of time exceeding the Low Shutdown Delay, an Auxiliary Low Shutdown will be issued, and the compressor will stop.

[Low Shutdown Delay] – This setpoint specifies the period of time that the associated auxiliary analog input must remain below the Low Shutdown Setpoint before an Auxiliary Shutdown will be issued.

[High Warning Setpoint] – This setpoint specifies the High Warning threshold. In the event that the associated auxiliary analog input exceeds this value for a period of time exceeding the High Warning Delay, an Auxiliary High Warning will be issued.

[High Warning Delay] – This setpoint specifies the period of time that the associated auxiliary analog input must remain above the High Warning Setpoint before an Auxiliary High Warning will be issued.

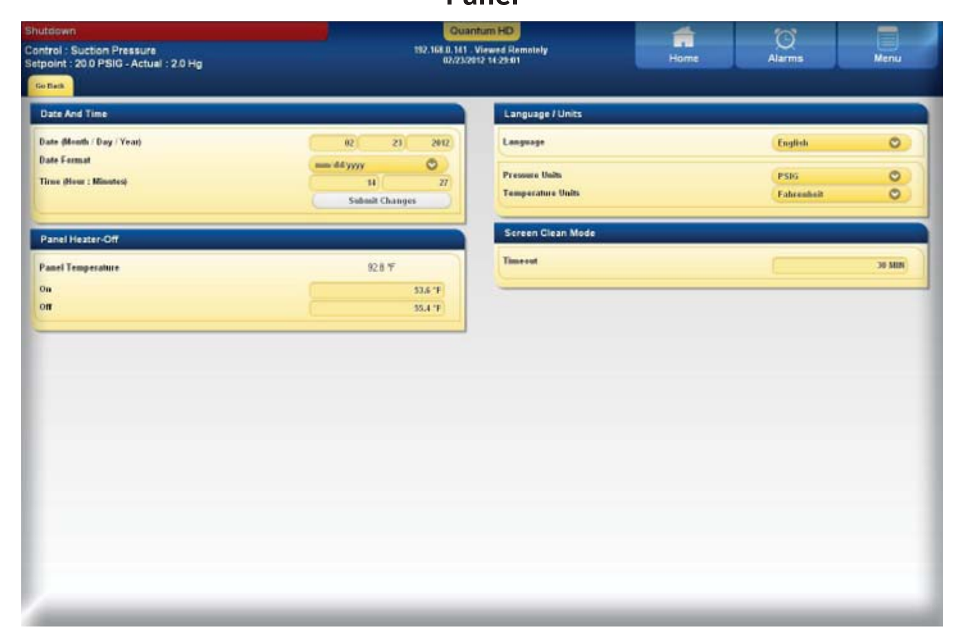
[High Shutdown Setpoint] – This setpoint specifies the High Shutdown alarm threshold. In the event that the associated auxiliary analog input exceeds this value for a period of time exceeding the High Shutdown Delay, an Auxiliary High Shutdown will be issued, and the compressor will stop.

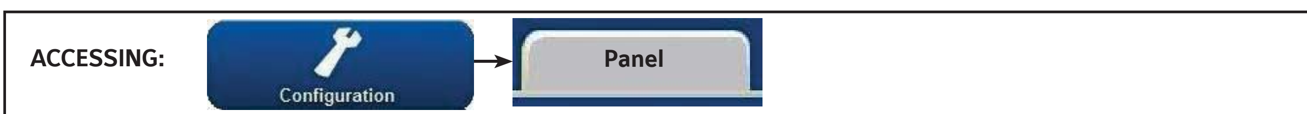
[High Shutdown Delay] – This setpoint specifies the period of time that the associated auxiliary analog input must remain above the High Shutdown Setpoint before an Auxiliary Shutdown will be issued.

NOTE: If you wish to bypass the warnings and utilize only the shutdown feature, then set all warning values outside of the shutdown values.

CONFIGURATION

Panel





DESCRIPTION: This screen is used to view and set basic control panel functions.

DATE AND TIME

The following setpoint and pop-up menus are provided:

Date:

[Month]

Enter a value from 1 to 12 to correspond with the number of the month.

January = 1	July = 7
February = 2	August = 8
March = 3	September = 9
April = 4	October = 10
May = 5	November = 11
June = 6	December = 12

[Day]

Enter a number 1 – 31 to correspond with the day of the month.

[Year]

Enter a four digit number for the year.

Date Format - You may choose from the following list:

- US - (Month/Day/Year format)
- Europe - (Day/Month/Year format)

Time:

[Hour]

Enter a value from 0 to 23 (military time format) to represent the current hour. Refer to the following:

1 AM = 1	1 PM = 13
2 AM = 2	2 PM = 14
3 AM = 3	3 PM = 15
4 AM = 4	4 PM = 16
5 AM = 5	5 PM = 17
6 AM = 6	6 PM = 18
7 AM = 7	7 PM = 19
8 AM = 8	8 PM = 20
9 AM = 9	9 PM = 21
10 AM = 10	10 PM = 22
11 AM = 11	11 PM = 23
12 AM = 12	12 PM = 0

[Minutes]

Enter a value from 0 to 59 to represent the current minute.

PANEL HEATER

The Q5 processor board is equipped with a temperature sensor. The panel has an operational temperature range that should be maintained, and is documented in the specifications document. The following is provided:

Panel Temperature

This value shows the current temperature being read on the control board. If the panel has the optional panel heater installed, use the following two setpoint boxes to maintain the panel temperature in a range between two specified values:

On

Enter the value that represents the temperature that you wish to it to energize at.

Off

If the panel has the optional panel heater installed, enter the value that represents the temperature that you wish to it to de-energize at.

LANGUAGE / UNITS

The following pop-up menus have been provided:

Language - You may choose from the following list:

- English

Pressure Units - You may choose from the following list:

- kpaA
- Bar
- BarA
- PSIA
- PSIG
- kpaG

Temperature Units - You may choose from the following list:

- Celsius
- Fahrenheit

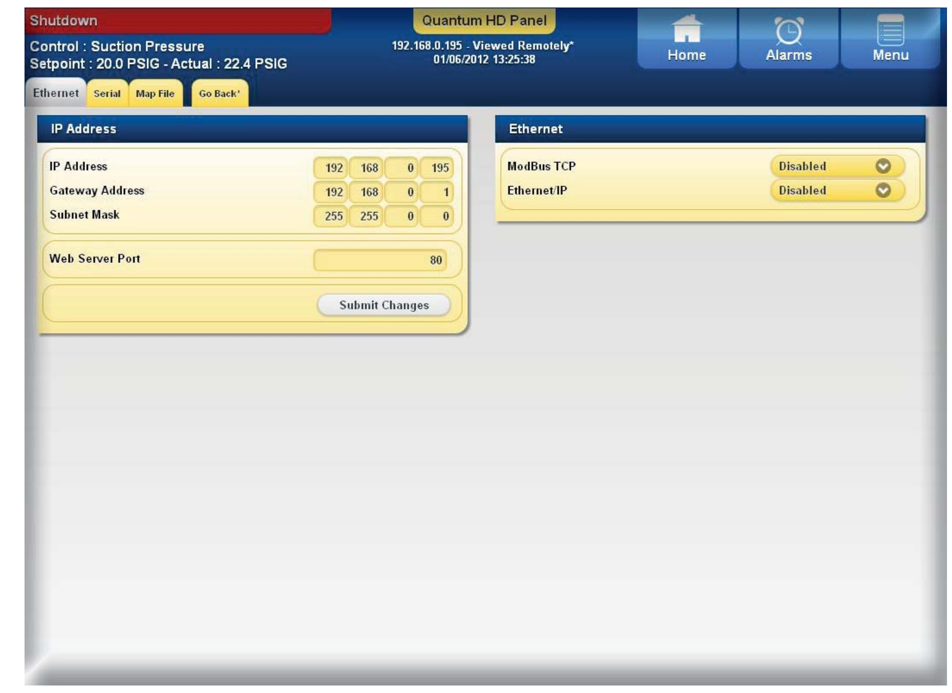
SCREEN CLEAN MODE

A timer setpoint box has been provided:

Timeout - This timer will begin to time after the Screen Clean Mode has been activated. If the user does not manually exit the Screen Clean Mode intentionally before this timer times out, the Screen Clean Mode will be cancelled and the display will be returned to the Home screen.

CONFIGURATION

Communications - Ethernet



ACCESSING:



DESCRIPTION: This screen is used to view and set basic Ethernet operational values. **NOTE:** A valid internet account and connection must be available for this feature to function.

IP ADDRESS

The following fields are provided:

[IP Address] - Four setpoint boxes are provided. The network administrator will enter the numerical IP address for this specific Quantum™ HD panel. This setpoint box will be automatically assigned if the address type is set to DHCP.

[Gateway Address] - Four setpoint boxes are provided. The network or LAN administrator will enter the numerical Gateway address. This setpoint box will be automatically assigned if the address type is set to DHCP.

[Subnet Mask] – Like IP addresses, a subnet mask contains four bytes (32 bits) and is often written using the same “dotted-decimal” notation. Subnet masks accompany an IP address and the two values work together. This setpoint box will be automatically assigned if the address type is set to DHCP. Applying the subnet mask to an IP address splits the address into two parts, an extended network address and a host address. For a subnet mask to be valid, its leftmost bits must be set to ‘1’. Conversely, the rightmost bits in a valid subnet mask must be set to ‘0’, not ‘1’.

All valid subnet masks contain two parts: the left side with all mask bits set to ‘1’ (the extended network portion) and the right side with all bits set to ‘0’ (the host portion).

[Web Server Port] - One setpoint box is provided. The network administrator will enter the numerical address for this Web port (80 is typical).

[Submit Changes] - Select this button after changes have been made to the above settings to submit them to the control program.

ETHERNET

The following fields are provided:

[ModBus TCP]

- Disabled
- Enabled

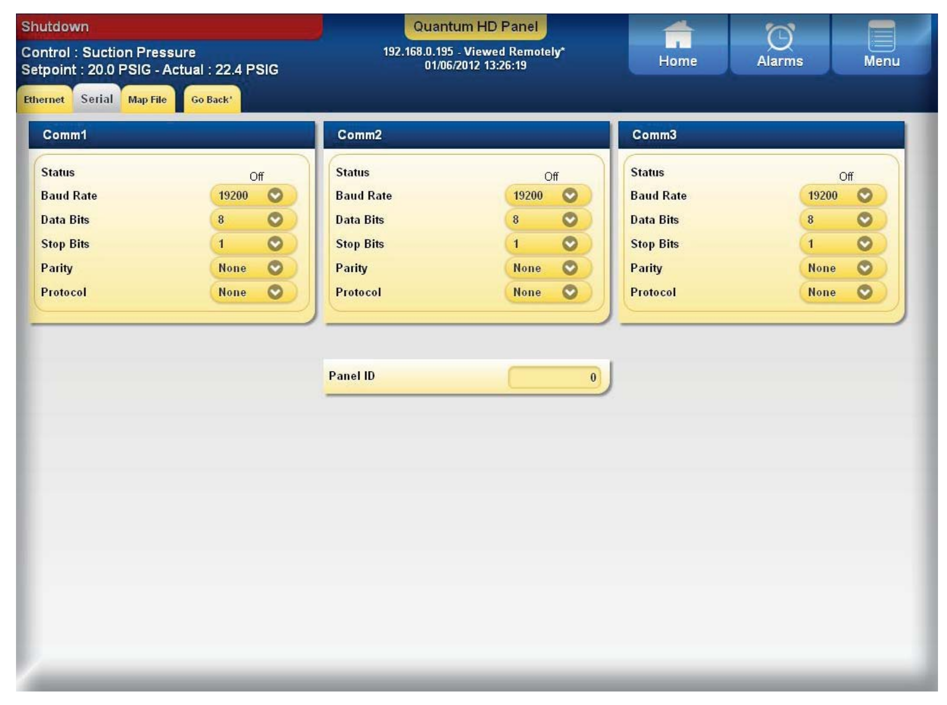
[Ethernet/IP]

- Disabled
- Enabled



CONFIGURATION

Communications - Serial





DESCRIPTION: This screen is used to set the Serial communications parameters for Comm1, Comm2 and Comm 3.

The following setpoints are provided (these settings are identical for Comm1, Comm2 and Comm3:

COMM1 (2 AND 3)

Status - Shows the current communications status of the port. The possible messages are:

- **Off** - No communications are currently taking place. NOTE: A delay of 15 seconds or more of inactive communications (time between valid responses) will cause this message to display.
- **Active** - Valid communications are actively occurring.
- **Failed** - An invalid command was received by the port. This could be due to a bad checksum value, a wiring issue, or hardware problem at either the transmitting (host) or receiving (Quantum™ HD) end.

[Baud Rate] - The baud rate defines the speed at which external communications can occur. The higher the baud rate, the faster the communications. A pop-up menu is provided to select from the following:

- 1200
- 2400
- 4800
- 9600
- 19200
- 38400
- 57600
- 115200

[Data Bits] - The number of bits in a transmitted data package. A pop-up menu is provided:

- 7
- 8

[Stop Bits] - A bit(s) which signals the end of a unit of transmission on a serial line. A pop-up menu is provided to select from the following:

- 1
- 2

[Parity] - Parity checking refers to the use of parity bits to check that data has been transmitted accurately. The parity bit is added to every data unit (typically seven or eight data bits) that is transmitted. The parity bit for each unit is set so that all bytes have either an odd number or an even number of set bits. Parity checking is the most basic form of error detection in communications. A pop-up menu is provided:

- None

- Even
- Odd

[Protocol] – A protocol is the special set of rules that each end of a communications connection use when they communicate. A pull down menu is provided to select from the following Frick recognized protocols:

- None
- Frick
- ModBus ASCII
- ModBus RTU
- AB DF1 Full Duplex
- AB DF1 Half Duplex
- DBS Motor Starter
- Vyper™

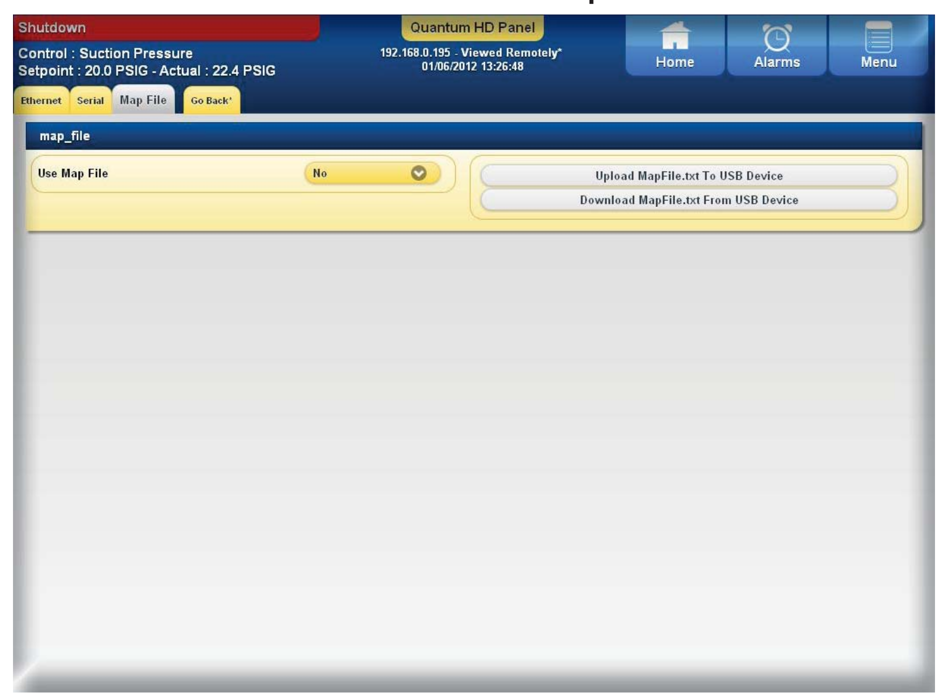
An additional button is provided to allow the user to set the Panel Id for this unit:

[Panel ID] – A number that is used by an external communications application, to converse to individual compressors. On interconnected systems, this number must be unique. Valid values are 0 - 99.



CONFIGURATION

Communications - Map File





DESCRIPTION: This screen allows the user to upload a previously created serial communications application that was originally done for the Quantum™ LX, and to convert the addresses so that they can be used for the Quantum™ HD. Additional information can be found in the Communications Setup manual (090.040-CS).

MAP FILE

The following selections are provided:

[Map File] - Because the addressing scheme between the Quantum™ LX version 7.0x and earlier software and the Quantum™ HD version 10.0x and later software is not the same, this utility was created. The map file is a conversion utility that can be used to allow a communications application that was previously written for the Quantum™ LX version 7.0x and earlier to function properly with the HD by redirecting the old HD addresses to the new HD addresses. A pull down menu is provided:

- **No** - Do not use map file, the user is either not going to be using external communications, or they will be writing the communication application based upon the HD addresses.
- **Yes** - The user has an application that was previously written for the Quantum™ LX version 7.0x or earlier, and they want to utilize the same code for the HD.

Two keys are located on the right side of the screen.

The following describes their function:

[Upload MapFile.txt to USB Device] – After the user has modified the MapFile.txt file to suit their needs, pressing this key will cause the file to be uploaded from the USB memory back into the Quantum™ HD.

[Download MapFile.txt from Quantum™ HD] – With a USB memory stick installed on the HD, pressing this key will cause the MapFile.txt file to be downloaded from the Quantum™ HD into the USB memory.

NOTE: Devices that are formatted using any of the following formats have been verified to function properly:

Windows:

- FAT32
- NTFS
- FAT

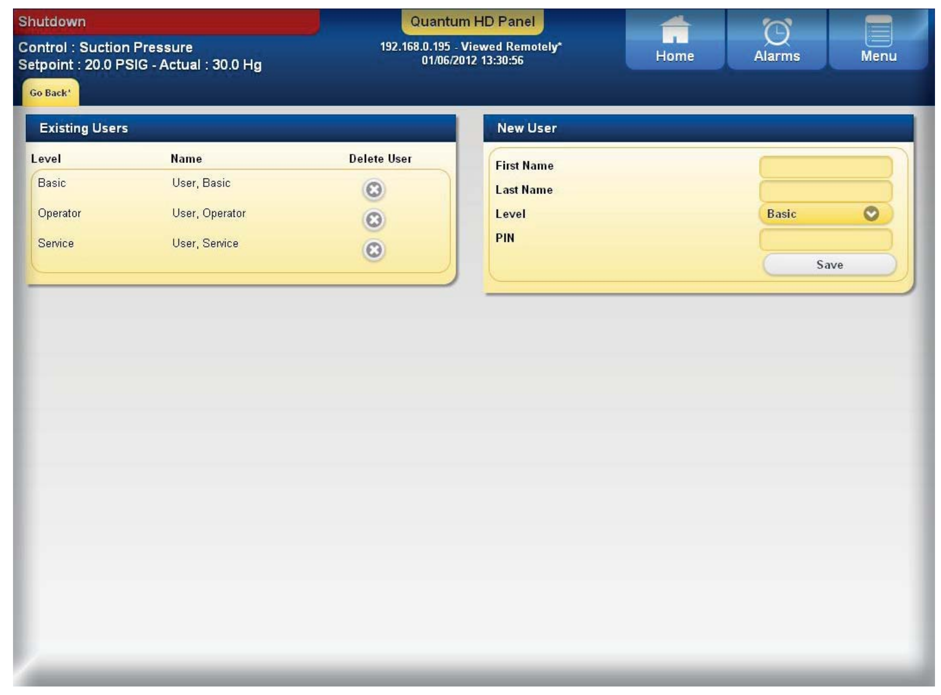
Linux:

- Linux ext2

Although numerous brands and storage sizes of USB thumb drive devices have been tested for compatibility with the Quantum™ HD system, there is a possibility that not all USB thumb drives will work.

CONFIGURATION

Security





DESCRIPTION: This screen allows the user to set various levels of password protection for multiple users.

NOTE: It is advisable when creating a new user for each level, that the existing default user for that level be deleted (shown below).

EXISTING USERS

This area provides a listing of all currently assigned users, along with their assigned user access level. The information that is visible here is set up in the adjacent box, labeled as New User:

Level - One of three possible user levels are shown here, they are:

Basic - This provides access to only the very basics of unit operation.

Operator - This provides greater access than the Basic level.

Service - This provides the greatest access to unit operation.

Name - The name of the user is located here, in the format of last name followed by first name.

Delete User - Select this button to completely delete a user. You will be prompted with a message asking if you wish to continue.

NEW USER

Use this area to assign new users to the system. If you wish to only change the access level or PIN number of an existing user, you must first delete that user, then re-enter the information here:

First Name - Enter the new users first name.

Last Name - Enter the new users last name.

Level - Assign the level of unit access that you wish this user to possess. The selections are:

Basic - This provides access to only the very basics of unit operation.

Operator - This provides greater access than the Basic level.

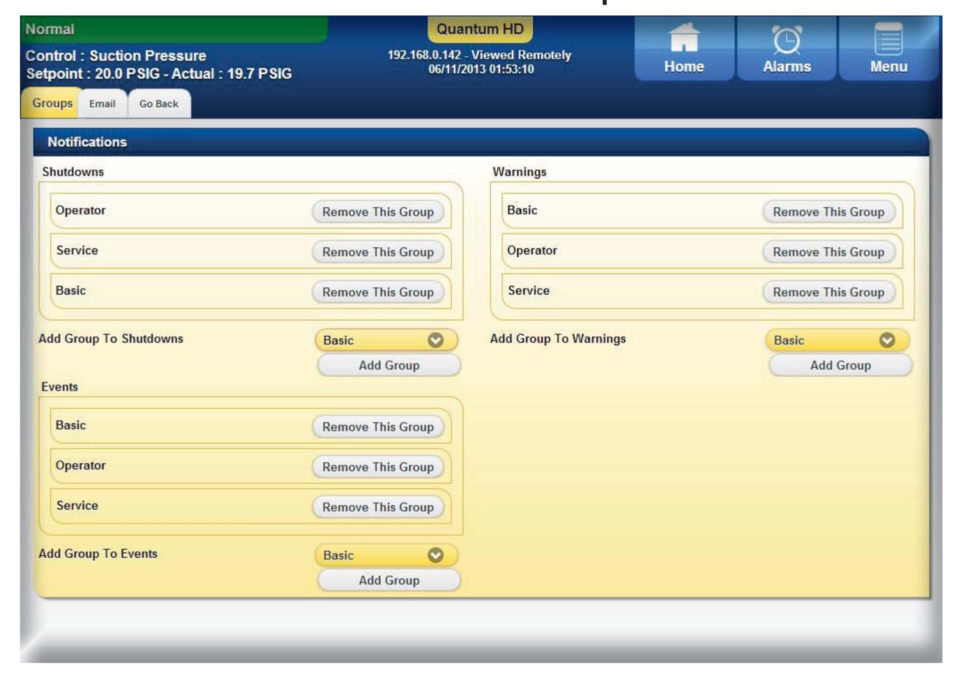
Service - This provides the greatest access to unit operation.

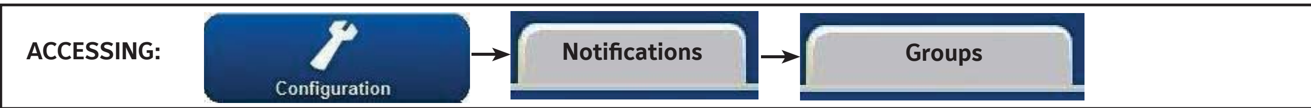
PIN - Enter a PIN number for this user. The PIN number is strictly numeric, and can use as little as a single digit or as many as practicable.



CONFIGURATION

Notifications - Groups





DESCRIPTION: This screen allows the user to select user level groups to receive e-mail notifications of system Shutdowns, Warnings or Events.

Each time one of these Shutdowns/Warning/Events occurs, all groups that have been selected under that heading will be sent an e-mail describing what has occurred.

The following areas of notification appear on this screen:

Shutdowns

Warnings

Events

The Quantum™ HD program comes defaulted with all user level groups eligible to receive notifications from all three areas, as shown on the screen above.

The three user groups are:

Basic

Operator

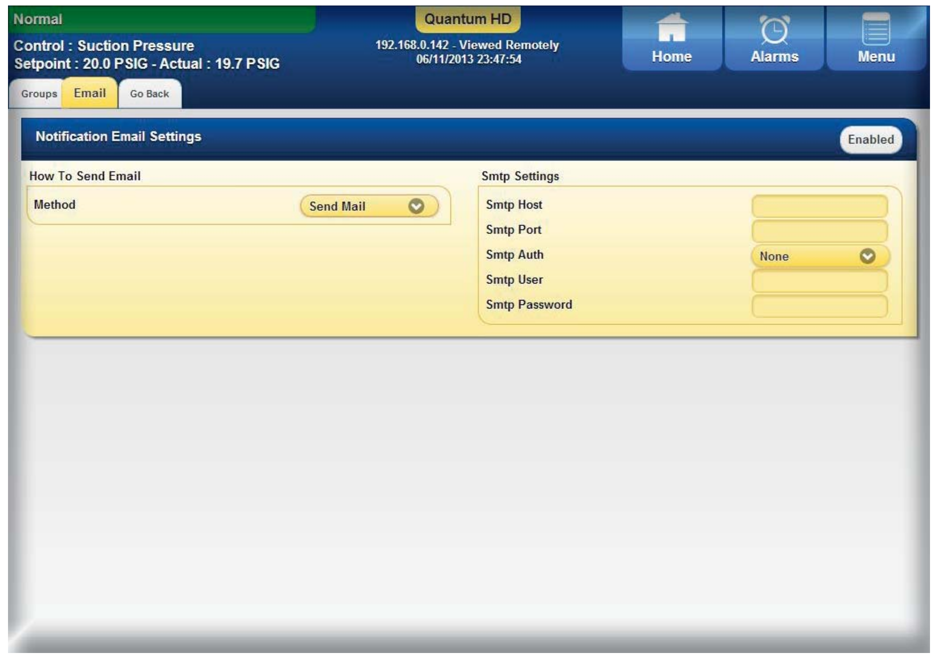
Service

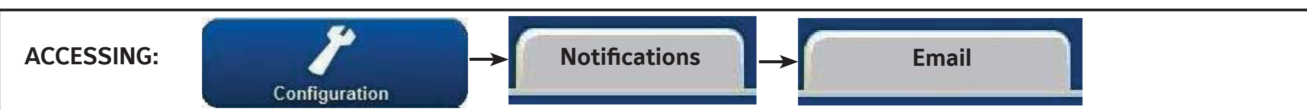
Each of these user groups are defined and setup on the *Security* screen.

To remove a group from any of the notifications areas, simply select the button labeled as **[Remove This Group]** adjacent to the group you wish to remove. A group may be added (that doesn't already appear) by selecting the **[Add Group]** button, and pick the group from the list that appears.

CONFIGURATION

Notifications - Email





DESCRIPTION: Use this screen setup the Email Notifications parameters. This screen should be setup by an individual from the IT department who is familiar with these settings.

The following areas appear on this screen:

How To Send Email

- **Send Mail**
- **SMTP** - This stands for Simple Mail Transfer Protocol.

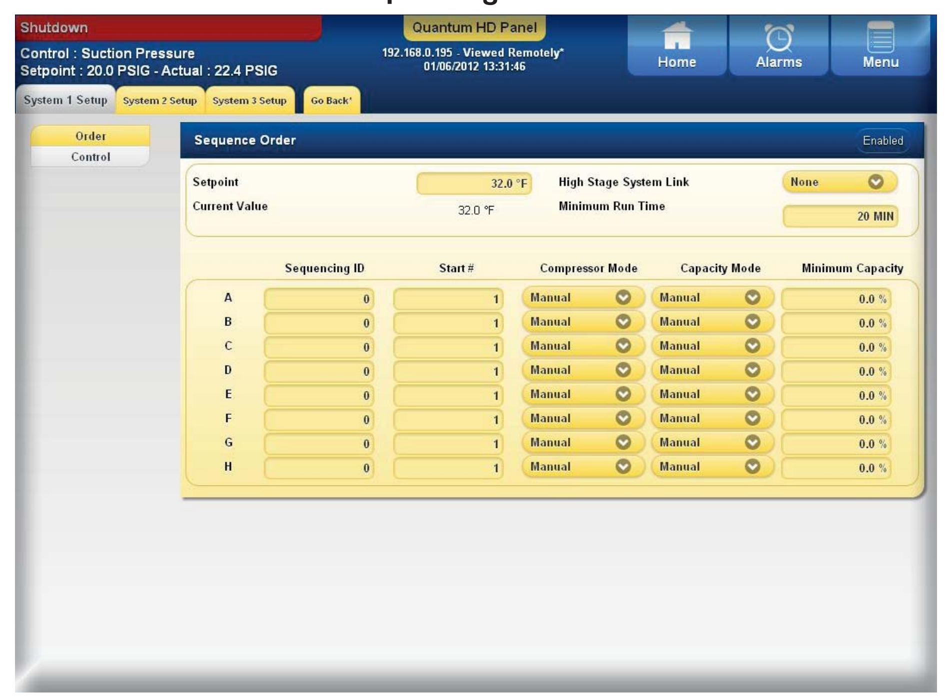
SMTP Settings

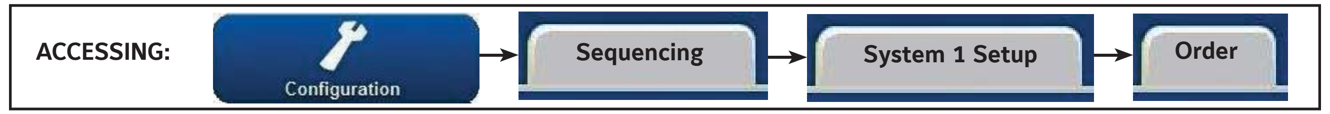
- **SMTP Host** - The servers address.
- **SMTP Port** - Typically 25, 2525 or 587
- **SMTP Auth** - Select one of the following:
  - **None**
  - **SSL**
  - **TLS**
- **SMTP User** - Enter the User name for this email account.
- **SMTP Password** - Enter the password for this email account.



CONFIGURATION

Sequencing - Order





DESCRIPTION: This screen will be available if Sequencing is enabled in Compressor configuration. The screen shown represents System 1. There are additionally a System 2 and a System 3 setup screen, which are not discussed further here, as all three screens show the same layout, although they may get setup using different capacity modes. Use these screens to setup all of the necessary operating parameters for performing compressor sequencing. The information from these three screens will be shown on the Sequencing Status screen.

SEQUENCE ORDER

On the blue **Sequence Order** status bar, is an Enable / Disable button. Use this button to set the current condition of System 1 (2 or 3):

- **Disabled** - The compressors that are listed on this screen will not run as part of the sequencing scheme (System 1 will be ignored).
- **Enabled** - The compressors that are listed on this screen will run when called for as part of the sequencing scheme (System 1 will be included).

The following pop-up menus and setpoint boxes are shown here:

Setpoint - Use this setpoint box to set the value that you wish all compressors within this System to maintain.

High Stage System Link - The High Stage System Link setpoint is provided to tie a system of Booster compressors to a system of High Stage compressors.

Current Value - This is the actual value for the capacity control (as measured from the Master compressor). The master compressor is the unit with the lowest IP Address. It is to this value that the compressors will attempt to maintain. This is strictly a displayed value, and cannot be changed here.

Minimum Run Time - This is the minimum amount of time that each compressor within this system will run, when called upon to do so.

There are eight rows of setpoint boxes shown at the bottom of this screen. These rows correspond to up to eight different compressors, which combined will make up this system. The user may program as few or as many of these rows as their situation requires:

Sequencing ID - Enter the last octet of the IP Address here. This will identify each of the possible eight compressors to the Master. A row with a 0 (zero) as the sequencing ID will be ignored. The lowest IP address will identify which compressor is to be the Master. For example, assume that there are two compressors in the sequence order with the following IP addresses:

116.168.0.141 and 116.168.0.142,

The panel with IP address 116.168.0.141 will be master. If the Master is for some reason turned off, the next lowest numbered compressor will become the Master, and so on.

Start # - The allowable numbers here are 0 – 8. This number determines which compressor to start or stop next, based upon capacity need. Entering a 0 (zero) in this field will exclude the compressor from starting consideration.

Compressor Mode -

- Manual
- Automatic
- Remote Comm
- Remote IO
- Remote Seq.

Capacity Mode -

- Manual
- Automatic
- Remote Comm
- Remote 4-20
- Remote IO
- Remote Seq.

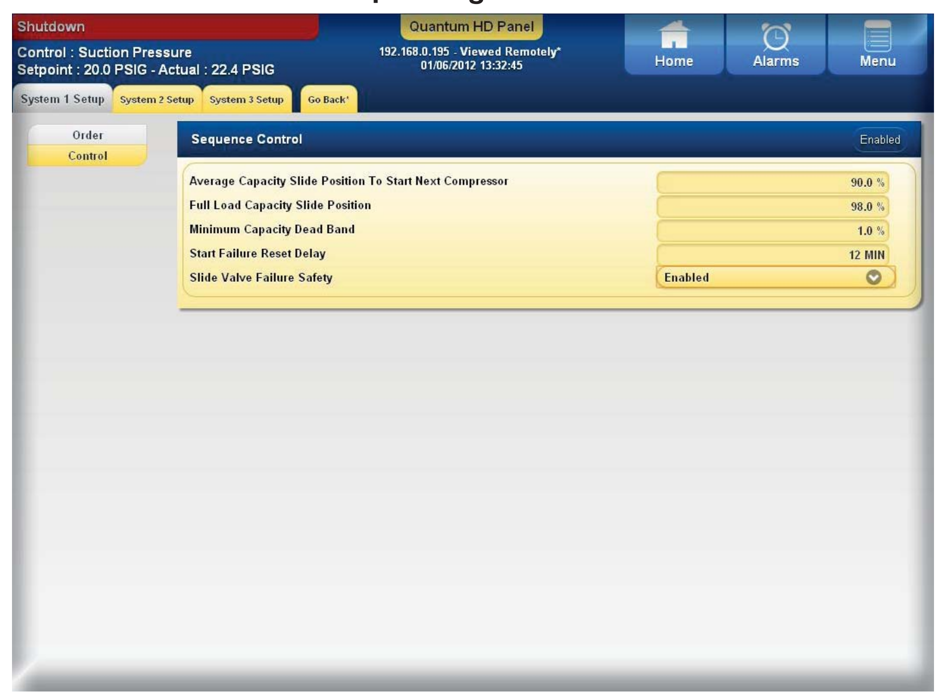
Minimum Capacity - This is the capacity that a compressor will load to when it is started. It will remain at or above this capacity until it is commanded to stop.

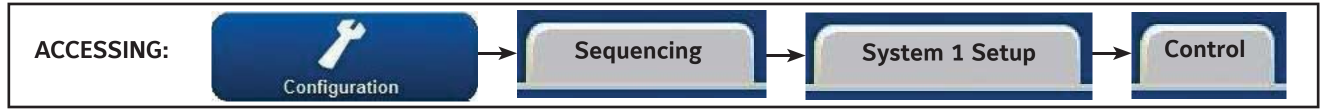
NOTE: The Compressor Mode and Capacity Mode listed above should both be set to Remote Seq. for complete execution of the sequencing system by the master to occur.



CONFIGURATION

Sequencing - Control





DESCRIPTION: This screen will be available if Sequencing is enabled in Compressor configuration. The screen shown represents System 1. There are additionally a System 2 and a System 3 setup screen, which are not discussed further here, as all three screens show the same layout, although they may get setup using different capacity modes. Use these screens to setup all of the necessary operating parameters for performing compressor sequencing. The information from these three screens will be shown on the Sequencing Status screen.

SEQUENCE CONTROL

On the blue **Sequence Order** status bar, is an Enable / Disable button. Use this button to set the current condition of System 1 (2 or 3):

- **Disabled** - The compressors that are listed on this screen will not run as part of the sequencing scheme (System 1 will be ignored).
- **Enabled** - The compressors that are listed on this screen will run when called for as part of the sequencing scheme (System 1 will be included).

The following pop-up menus and setpoint boxes are shown here:

Setpoint - Use this setpoint box to set the value that you wish all compressors within this System to maintain.

Average Capacity Slide Position to Start Next Compressor - If more than one compressor is running and the Average Capacity is greater than this setting, the next compressor in line can be started, if needed.

Full Load Capacity Slide Position - This setpoint represents the Capacity Slide Valve Position at which this machine will be considered at full load capacity.

Full Load Drive Speed Position - This is the speed value at which the compressor will be considered at full capacity by speed.

Minimum Capacity Dead Band - This is the dead band above and below the Minimum Capacity % setpoints that the controller will load or unload. If the Minimum Capacity % is 40% and the dead band is 1%, the controller will unload above 41% and load below 39% Capacity Slide.

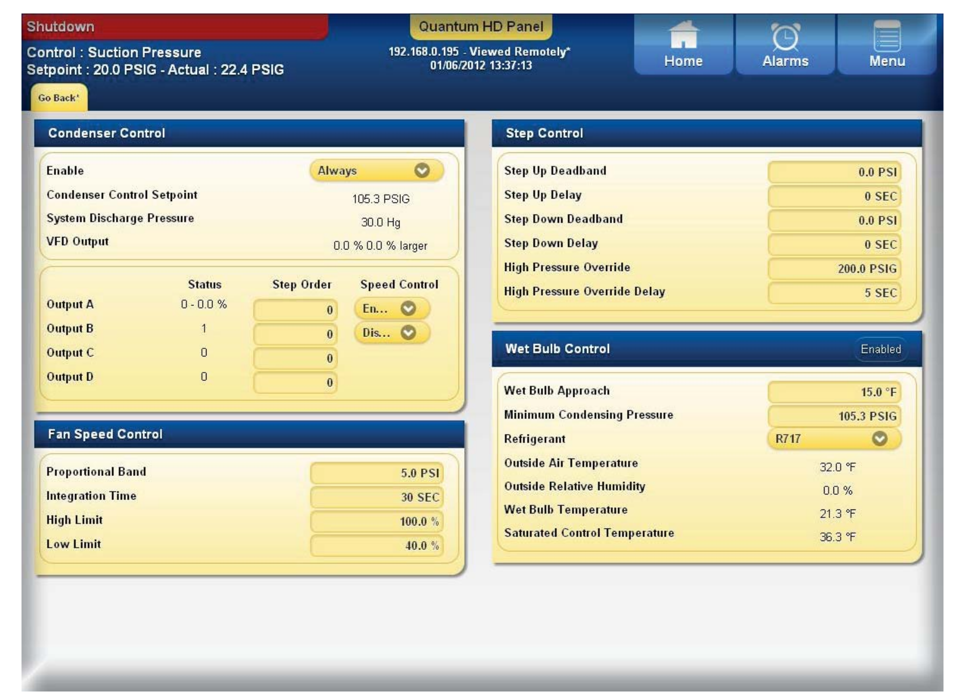
Start Failure Reset Delay - This is the time that needs to pass after a sequencing start fails before the compressor is available to be back in the sequence operation.

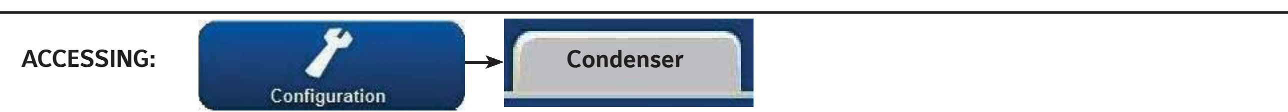
Slide Valve Failure Safety

- **Disabled**
- **Enabled**

CONFIGURATION

Condenser





DESCRIPTION: If Condenser is enabled, this screen allows the end user to enter and view the basic operating parameters related to condenser digital operation.

Wet Bulb Strategy

The Quantum™ HD Compressor control panel provides a Wet Bulb control strategy which has the ability to run a condenser based on current atmospheric conditions by sensing the outdoor air temperature and humidity. This technique, which is sometimes referred to as floating head pressure, provides the ability to run a refrigeration system at the lowest attainablr head pressure. Traditional condenser control uses a fixed head pressure that does not change with weather conditions or system load. However studies have found that allowing the condenser/head pressure to float will result in energy savings. These savings result from the compressor not working as hard. While the condenser may use more energy to achieve a lower head pressure, the reduction in energy consumption by the compressor is significantly greater, providing an overall savings.

The Wet Bulb control utilizes a humidity sensor along with a standard (dry bulb) temperature sensor. These values are combined to calculate a Wet Bulb temperature. The Wet Bulb Approach temperature is then added to the calculated Wet Bulb temperature. The Approach temperature sets how close the condenser will run to the Web Bulb temperature and will be determined by the condenser and system design.

Finally, the Control temperature (which is the sum of the Wet Bulb Temperature and the Approach Temperature) is converted to the saturated vapor pressure which in turn becomes the condenser control pressure. A minimum condensing pressure setpoint specifies the lowest permissible condenser control pressure, and is often dictated by expansion valves or hot gas requirements.

The following setpoints and pop-up menus are provided:

CONDENSER

Condenser

- **Disabled**
-
- **Enabled**

[Condenser Control Setpoint] – This is the value that the Condenser will be controlled to.

System Discharge Pressure – The current System Discharge Pressure is shown here.

VFD Output – This value represents the amount of VFD output to the condenser fan(s).

Output A - D - The four digital output modules are enabled by putting a number (1-4) into the Step Order setpoint boxes. These determine the order that



the modules are turned on or off. If a Module has a 0 (zero) as its Step Order setpoint, it is disabled from the control process.

Speed Control

- **Disabled**
- **Enabled**

FAN SPEED CONTROL

Proportional Band – The range over which the PI control will be managing the Variable Speed Fan (provided Integration Time is not set to zero, in which case it will be strictly proportional).

Integration Time – This setpoint controls the influence that the Integral component exerts on the PI Output value. The Integral component works to push the Control Input toward the Control Setpoint by tracking the difference between the Control Input and the Control Setpoint over time.

High Limit – The percentage of the 4-20mA signal which should be considered full On (usually 100%).

Low Limit – The percentage of the 4-20mA signal which should be considered full Off (usually 0%).

STEP CONTROL

[Step Up Deadband] and **[Step Up Delay]** – When the System Discharge Pressure stays above the combined values of the Condenser Control Setpoint plus the Step Up Deadband for the amount of time as set in the Step Up Delay, the next module in the Step Order will turn on.

[Step Down Deadband] and **[Step Down Delay]** – When the System Discharge Pressure stays below the difference of the values for Condenser Control Setpoint minus the Step Down Deadband for the amount of time as set in the Step Up Delay, the next module in the Step Order will turn off.

[High Pressure Override] and **[High Pressure Override Delay]** - When the System Discharge Pressure goes and stays at or above the High Pressure Override value for the amount of time as set in the High Pressure Override Delay, all modules will turn on.

WET BULB CONTROL

Wet Bulb Approach – This is a value to be entered by the facilities refrigeration engineer, which will be added to the Wet Bulb Temperature to determine the Control Temperature.

Minimum Condensing Pressure –This value specifies the lowest condenser control pressure that is permitted while the wet bulb control strategy is in use.

Refrigerant – Select the type of refrigerant that is being used in the compressor.

- R22
- R134a
- R717
- R744

Outside Air Temperature – The value shown here is the actual Outside Air Temperature.

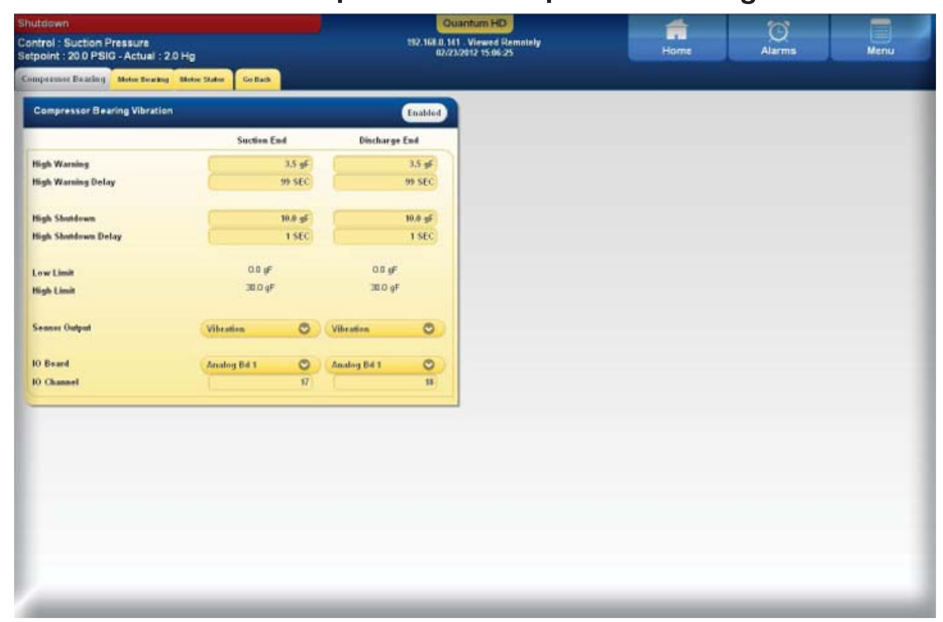
Outside Relative Humidity – The value shown here is the actual Outside Relative Humidity.

Wet Bulb Temperature – The value shown here is the calculation of ambient air temperature and relative humidity to arrive at a Wet Bulb value. This value is used in calculating the Control Setpoint when Wet Bulb is enabled.

Saturated Control Temperature – The value shown here is the Saturated Control Temperature.

CONFIGURATION

PHD Vibration / Temperature - Compressor Bearing Vibration





DESCRIPTION: Use this screen to configure the Compressor Bearing Vibration. The following setpoint and selection boxes are provided:

COMPRESSOR BEARING VIBRATION

Compressor Bearing Vibration

- **Disabled**
- **Enabled**

[High Warning] - If the Compressor Bearing vibration exceeds this setpoint for the amount of time as set for the High Warning Delay, then a Warning is issued.

[High Warning Delay] - The time period as set here will begin to time down if the Compressor Bearing vibration exceeds that of the High Warning, and remains above. When this delay times out, a Warning will be issued.

[High Shutdown] - If the Compressor Bearing vibration exceeds this setpoint for the amount of time as set for the High Shutdown Delay, then a Shutdown will occur, and the compressor is stopped.

[High Shutdown Delay] - The time period as set here will begin to time down if the Compressor Bearing vibration exceeds that of the High Shutdown, and remains above. When this delay times out, a Shutdown will occur, and the compressor is stopped.

[Sensor Output] - The following selections are provided:

- **0-5V**
- **1-5V**
- **4-20mA** (If 4-20mA is selected, the Low Limit and High Limit setpoints will need entered).
- **ICTD**
- **RTD**
- **0-20mA**
- **0-10V**
- **2-10V**

[I/O Board] - The following selections are provided:

None
Analog Bd 1
Analog Bd 2

[I/O Channel] - A setpoint entry box is provided to select the analog board output channel that you wish to use.



CONFIGURATION

PHD Vibration / Temperature - Motor Bearing Temperature / Vibration





DESCRIPTION: Use this screen to configure the Motor Bearing for either temperature or vibration. The following setpoint and selection boxes are provided:

MOTOR BEARING TEMPERATURE

Motor Bearing Temperature

- **Disabled**
- **Enabled**

[High Warning] - If the Motor Bearing temperature exceeds this setpoint for the amount of time as set for the High Warning Delay, then a Warning is issued.

[High Warning Delay] - The time period as set here will begin to time down if the Motor Bearing temperature exceeds that of the High Warning, and remains above. When this delay times out, a Warning will be issued.

[High Shutdown] - If the Motor Bearing temperature exceeds this setpoint for the amount of time as set for the High Shutdown Delay, then a Shutdown will occur, and the compressor is stopped.

[High Shutdown Delay] - The time period as set here will begin to time down if the Motor Bearing temperature exceeds that of the High Shutdown, and remains above. When this delay times out, a Shutdown will occur, and the compressor is stopped.

[Low Limit] - If the Motor Bearing temperature falls below this setpoint, a Warning is issued.

[High Limit] - If the Motor Bearing temperature rises above this setpoint, a Warning is issued.

[Sensor Output] - The following selections are provided:

0-5V
1-5V
4-20mA
ICTD
RTD
0-20mA
0-10V
2-10V

[I/O Board] - The following selections are provided:

None
Analog Bd 1
Analog Bd 2

[I/O Channel] - A setpoint entry box is provided to select the analog board output channel that you wish to use.

MOTOR BEARING VIBRATION

Motor Bearing Vibration

- **Disabled**
- **Enabled**

[High Warning] - If the amount of vibration exceeds this setpoint for the amount of time as set for the High Warning Delay, then a Warning is issued.

[High Warning Delay] - The time period as set here will begin to time down if the amount of vibration exceeds that of the High Warning, and remains above. When this delay times out, a Warning will be issued.

[High Shutdown] - If the amount of vibration exceeds this setpoint for the amount of time as set for the High Shutdown Delay, then a Shutdown will occur, and the compressor is stopped.

[High Shutdown Delay] - The time period as set here will begin to time down if the amount of vibration exceeds that of the High Shutdown, and remains above. When this delay times out, a Shutdown will occur, and the compressor is stopped.

[Sensor Output] - The following selections are provided:

0-5V
1-5V
4-20mA
ICTD
RTD
0-20mA
0-10V
2-10V

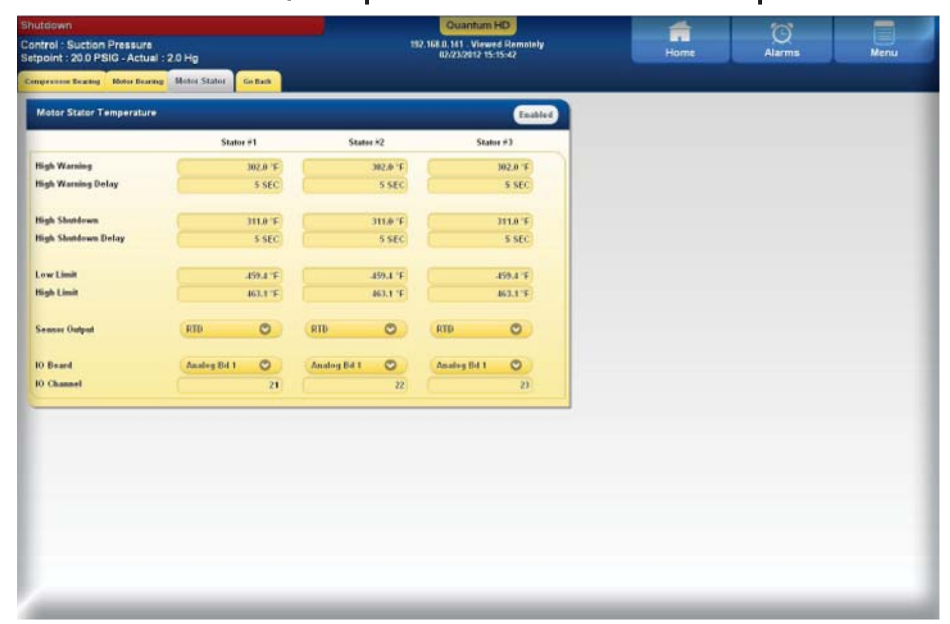
[I/O Board] - The following selections are provided:

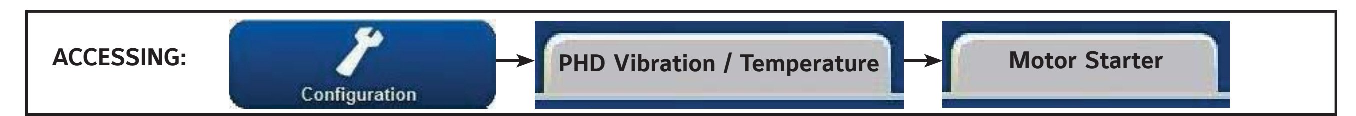
None
Analog Bd 1
Analog Bd 2

[I/O Channel] - A setpoint entry box is provided to select the analog board output channel that you wish to use.

CONFIGURATION

PHD Vibration / Temperature - Motor Stator Temperature





DESCRIPTION: Use this screen to configure the Motor Stator temperature(s). The following setpoint and selection boxes are provided:

MOTOR STATOR TEMPERATURE

Motor Stator Temperature

- **Disabled**
- **Enabled**

[High Warning] - If the Motor Stator temperature exceeds this setpoint for the amount of time as set for the High Warning Delay, then a Warning is issued.

[High Warning Delay] - The time period as set here will begin to time down if the Motor Stator temperature exceeds that of the High Warning, and remains above. When this delay times out, a Warning will be issued.

[High Shutdown] - If the Motor Stator temperature exceeds this setpoint for the amount of time as set for the High Shutdown Delay, then a Shutdown will occur, and the compressor is stopped.

[High Shutdown Delay] - The time period as set here will begin to time down if the Motor Stator temperature exceeds that of the High Shutdown, and remains above. When this delay times out, a Shutdown will occur, and the compressor is stopped.

[Low Limit] - If the Motor Stator temperature falls below this setpoint, a Warning is issued.

[High Limit] - If the Motor Stator temperature rises above this setpoint, a Warning is issued.

[Sensor Output] - The following selections are provided:

0-5V
1-5V
4-20mA
ICTD
RTD
0-20mA
0-10V
2-10V

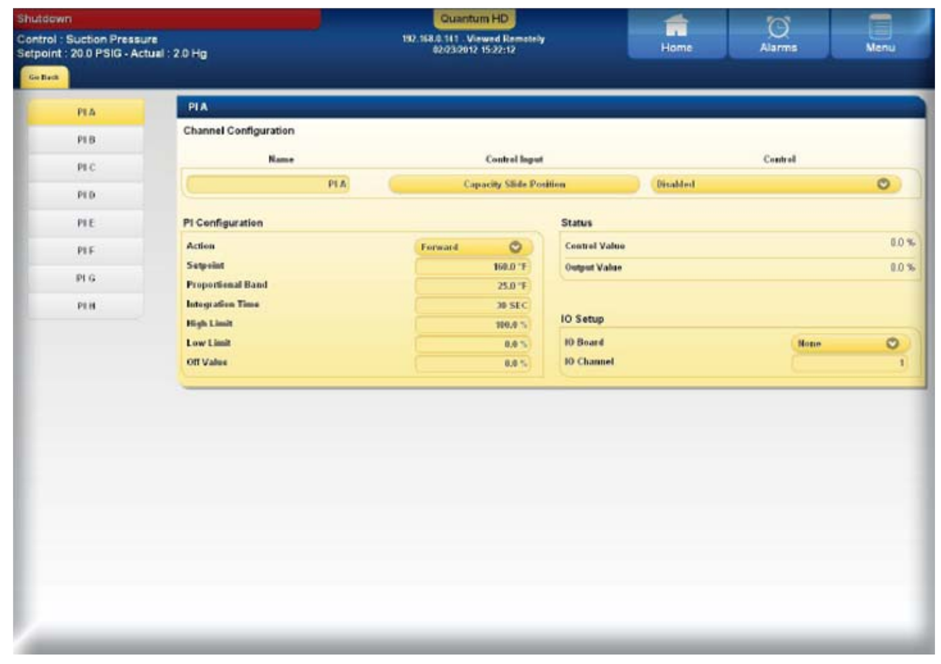
[I/O Board] - The following selections are provided:

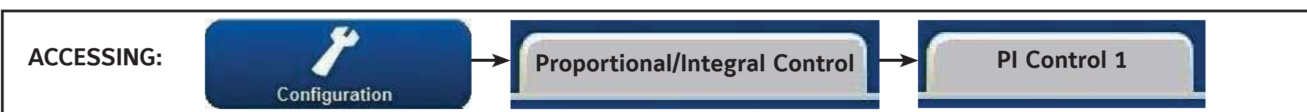
None
Analog Bd 1
Analog Bd 2

[I/O Channel] - A setpoint entry box is provided to select the analog board output channel that you wish to use.

CONFIGURATION

Proportional / Integral Control Setup





DESCRIPTION: Use this screen to configure the PI Control channels. There are eight total screens associated with PI Configuration (PI A - H), and all screens consists of the same layout:

CHANNEL CONFIGURATION

[Name] - A user defined name can be entered here.

[Control Input] - A pop-up box is provided to select from the following:

- Capacity Slide Position
- Volume Slide Position
- Suction Pressure
- Discharge Pressure
- Compressor Oil Pressure
- Main Oil Injection Pressure
- Economizer Pressure
- Filter Pressure
- Intermediate Pressure
- Balance Piston Pressure
- System Discharge Pressure
- Suction Temperature
- Discharge Temperature
- Compressor Oil Temperature
- Oil Separator Temperature
- Process/Brine Temperature Leaving
- Process/Brine Temperature Entering
- Remote Control Setpoint
- Motor Current
- RPM
- Auxiliary Analog #1 - #20
- Manifold Pressure
- Remote Capacity Position
- Compressor Vibration – Suction
- Compressor Vibration – Discharge
- Motor Vibration – Shaft Side
- Motor Vibration – Opposite Shaft Side
- Motor Temperature – Shaft Side
- Motor Temperature – Opposite Shaft Side
- Motor Stator #1 - #3
- Vyper Coolant Temperature

[Control] - A pull down menu is provided to select from the following:

- **Disabled** - No PID control.
- **Running** - PID Control only controls when the compressor is running.
- **Active** - PID control always active.

PI CONFIGURATION

[Action] - A pop-up box is provided to select from the following:

- **Forward** - Will increase the output at values greater than the Control Setpoint.
- **Reverse** - Will increase the output at values less than the Control Setpoint.

[Setpoint] - A setpoint box is provided to the value



that you wish to control to.

[Proportional Band] – This setpoint determines the size of a region either above or below the Control Setpoint. Within this region, the Proportional component of the PID Output value is the number between 0% and 100% that directly corresponds to the difference between the Control Input (Actual) and the Control Setpoint (Setpoint). Outside of this region, the Proportional component is either 100% or 0%. If the PI Action is Forward, the Proportional Band extends above the Control Setpoint. If the PI Action is Reverse, the Proportional Band extends below the Control Setpoint.

[Integration Time] - This setpoint controls the influence that the Integral component exerts on the PI Output value. The Integral component works to push the Control Input toward the Control Setpoint by tracking the difference between the Control Input and the Control Setpoint over time.

[High Limit] - The highest value that the output can be.

[Low Limit] - The lowest value that the output can be.

[Off Value] - If the PI Control is set to When Running, this value sets the value of the PI output when the compressor is off.

Setting up a PI Channel

NOTE: The basic steps in setting up a device for PI control is:

Setup Input channel

- First, decide which physical input channel you will be using. Note: If you wish to use an Auxiliary Analog channel, it will require being completely setup as its own channel before attempting the remainder of this procedure.

Setup PI parameters

- From the Home screen, access the Menu. Select **[Configuration]** > Proportional /Integral Control.
- On the Proportional / Integral Control screen, select the Analog channel that has already been set up, in this case, channel 1.
- It is on this Proportional / Integral Control screen that the remainder of the PI parameters are entered. For a detailed description of these parameters, refer to the Overview to Tuning a PI Controller.

Note: Each device that is utilized for PI control must also be properly calibrated.

Overview to Tuning a PI Controller

The purpose of this section is to give some basic guidelines for tuning Proportional, Integral, and Differential gains of a PI controller. To tune a PI controller, it would be advantageous to hook the system up to some test equipment to allow you to record the appropriate variables. At the very least, the appropriate data will have to be monitored and recorded by hand from the system screen for subsequent evaluation and possible spreadsheet graphing.

Proportional Band

The Proportional Band setpoint translates the Proportional Gain into the units of the Control Input channel. When the control Input is at the Control Setpoint, the Proportional component of the PI Output will be 0%. As the Control Input moves through the Proportional Band, and away from the Control Setpoint, the Proportional component will increase. If the Control Input is in the middle of the Proportional Band, the Proportional component value is 50%, and when the Control Input reaches the outside of the Proportional Band, the Proportional value will be 100%. The value of the Proportional component is calculated as the difference between the Control Input and the Control Setpoint, divided by the Proportional Band and then multiplied by 100.

Example:

Control Input: Discharge Temperature
Control Setpoint: 100° F
Dead Band: 0° F
Proportional Band: 10° F
Action: Forward

Control Input	Proportional Output
100° F	0%
102.5° F	25%
105° F	50%
108° F	80%
110° F	100%
112° F	100%

The value selected for the Proportional Band will be determined by the stability of the system, the accuracy required, and the average output value, among other things. One way to pick a starting value is to find a range of allowable Control Input values and then to select a Proportional Band so that the Proportional value will reach 100% before the Control Input moves outside of the allowable range.

After the initial value is entered for the Proportional Band, watch the system to see how it reacts. If the PI output shows too much oscillation, increasing the Proportional Band will cause the control to react slower, which will dampen this oscillation. If the PI reacts too slowly, then decreasing the Proportional Band will make the control react faster.

Proportional Only Control - There will be certain applications in which only proportional control is required for good performance. When this is the case, the Integration Time can simply be set to zero, and the Proportional Band set to a desired value.

Some advantages of only using Proportional control are that it is generally more stable than Proportional and Integral control, and its function is easier to understand. A disadvantage of only using Proportional control is that the Control Input usually will settle into a spot somewhere in the Proportional Band, and will not move to the Control Setpoint. For instance, from the example shown above, if the Proportional Output averages 80%, then the Control Input will remain at 108° F and will not go to 100° F. This may be acceptable in some applications. In certain other cases the setpoint can be offset to move the Control Input to the point it needs to be.

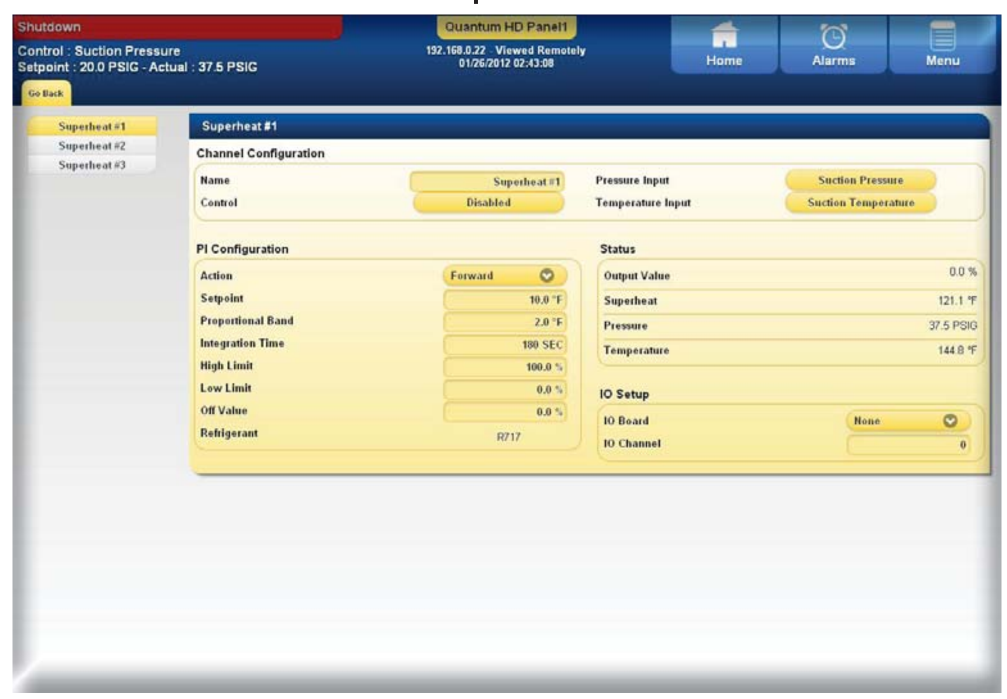
Integration Time - The Integral calculation in PI control uses past performance to calculate a value for the PI output. It does this by incrementally, over time, adding a small value to the PI output to move the Control Input toward the Control Setpoint. Eventually, the Integral component of the PI output will equal the average PI output value as Control Input gets to the Control Setpoint, and the Proportional component goes to 0%. When combined with the Integral calculation, the Proportional component can be negative and its range becomes -100% to +100%. If the Control Input moves above or below the Control Setpoint, the Proportional control will prevent it from moving too far, and the Integral control will move it back to the setpoint.

Once the Proportional Band is set, start with a large Integration Time (180 seconds). Here again, you want to find the range of Integration Time that gives you reasonably fast performance, without too much overshoot, and without too much oscillation. If the Control Input repeatedly overshoots the Control Setpoint, or oscillates too much, increasing the Integration Time will slow the control. If the Control Input moves too slowly toward the Control Setpoint, decreasing the Integration Time will cause the control to react faster.



CONFIGURATION

Superheat





DESCRIPTION: The Superheat screens are used to view and set the operational characteristics of the Superheat option. Each of the three screens consist of the same layout:

CHANNEL CONFIGURATION

[Name] - A user defined name can be entered here.

[Pressure Input] - A pop-up box is provided to select from the following input selections:

- Suction Pressure
- Discharge Pressure
- Compressor Oil Pressure
- Main Oil Injection Pressure
- Economizer Pressure
- Filter Pressure
- Intermediate Pressure
- Balance Piston Pressure
- System Discharge Pressure
- Auxiliary Analog #1 - #20
- Manifold Pressure

[Control] - A pop-up box is provided to select from the following:

- **Disabled** - No Superheat control.
- **Running** - Superheat Control only controls when the compressor is running.
- **Always** - Superheat control always active.

[Temperature Input] - A pop-up box is provided to select from the following input selections:

- Suction Temperature
- Discharge Temperature
- Compressor Oil Temperature
- Oil Separator Temperature
- Process/Brine Temperature Entering
- Process/Brine Temperature Leaving
- Auxiliary Analog 1 - 10
- EZ Cool Feedback %
- Auxiliary Analog 12 - 20

PI CONFIGURATION

[Action] - A pop-up box is provided to select from the following:

- **Forward** - Will increase the output at values greater than the Control Setpoint.
- **Reverse** - Will increase the output at values less than the Control Setpoint.

[Setpoint] - A setpoint box is provided to the value that you wish to control to.

[Proportional Band] – This setpoint determines the size of a region either above or below the Control Setpoint. Within this region, the Proportional component of the Superheat Output value is the number

between 0% and 100% that directly corresponds to the difference between the Control Input (Actual) and the Control Setpoint (Setpoint). Outside of this region, the Proportional component is either 100% or 0%. If the Superheat's Action is Forward, the Proportional Band extends above the Control Setpoint. If the Superheat's Action is Reverse, the Proportional Band extends below the Control Setpoint.

[Integration Time] - This setpoint controls the influence that the integral component exerts on the output value. The integral component works to push the calculated superheat value toward the setpoint by tracking the difference between the superheat value and the setpoint over time.

[High Limit] - The highest value that the output can be.

[Low Limit] - The lowest value that the output can be.

[Off Value] - If the Superheat's Control is When Running, this value sets the value of the Superheat output when the compressor is off.

Refrigerant - This will show the type of refrigerant, as set on the Configuration > Package screen.

STATUS

Output Value - The value of the Output signal as controlled by the Superheat. This is not a setpoint value.

Superheat - This is the calculated Superheat temperature based on the Temperature and Pressure described above. This is not a setpoint value.

Pressure - This is the value of the Control Pressure input signal. This is not a setpoint value.

Temperature - This is the value of the Control Temperature input signal. This is not a setpoint value.

I/O SETUP

[I/O Board] - A pop-up box is provided to select from the following:

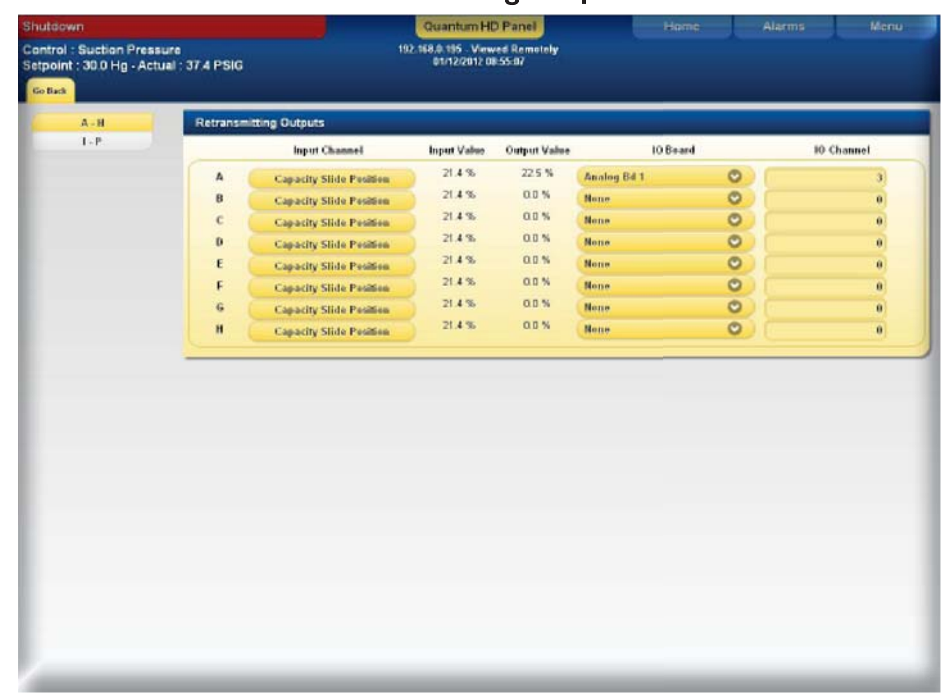
- **None**
- **Analog Board 1**
- **Analog Board 2**

[I/O Channel] - A setpoint entry box is provided to select the analog board output channel that you wish to use.



CONFIGURATION

Retransmitting Outputs





DESCRIPTION: The Retransmit Output screens (A-H and I-P) are used to view and set the analog input assignments, when it is desirable to use the retransmit feature. Both screens consists of the same layout, with the exception of the Input Channel name:

Input Channel (to Retransmit) - Use this pull down menu for each channel to select the analog signal that you would like to retransmit:

- Capacity Slide Position
- Volume Slide Position
- Suction Pressure
- Discharge Pressure
- Compressor Oil Pressure
- Main Oil Injection Pressure
- Economizer Pressure
- Filter Pressure
- Intermediate Pressure
- Balance Piston Pressure
- System Discharge Pressure
- Suction Temperature
- Discharge Temperature
- Compressor Oil Temperature
- Oil Separator Temperature
- Process/Brine Temperature Leaving
- Process/Brine Temperature Entering
- Remote Control Setpoint
- Motor Current
- RPM
- Auxiliary Analog #1 - #20
- Manifold Pressure
- Remote Capacity Position
- Compressor Vibration – Suction
- Compressor Vibration – Discharge
- Motor Vibration – Shaft Side
- Motor Vibration – Opposite Shaft Side
- Motor Temperature – Shaft Side
- Motor Temperature – Opposite Shaft Side
- Motor Stator #1 - #3
- Vyper Coolant Temperature

Input Value - This will show the analog value that is being received for a particular channel.

Output Value - This will show the analog value that is being sent from a particular channel.

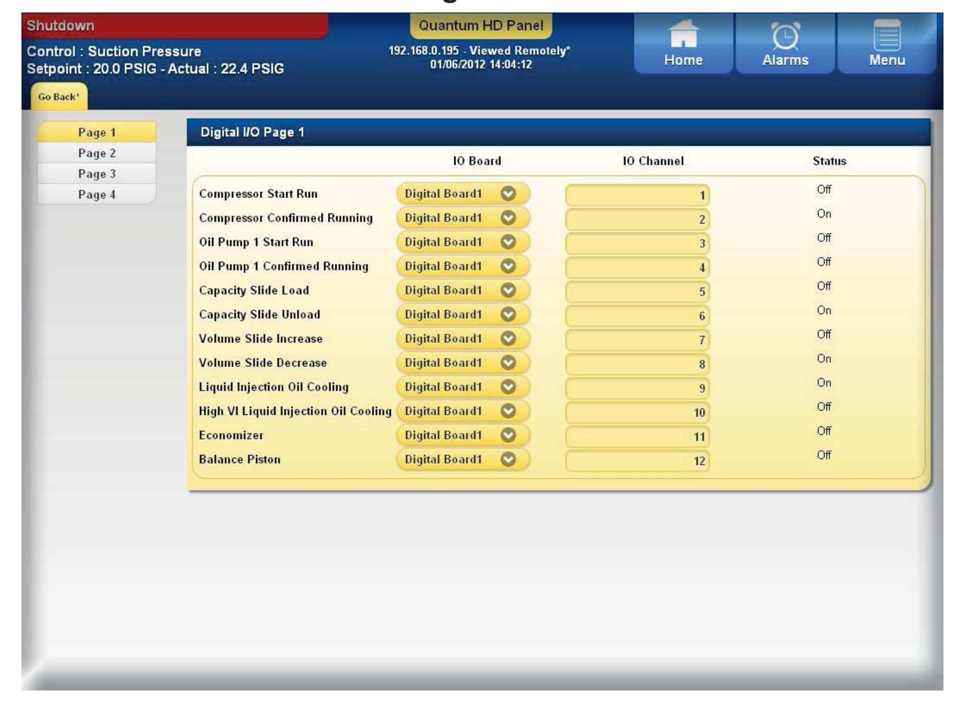
IO Board - Use this pull down menu to select the source of the retransmit signal:

- **None**
- **Analog Board 1**
- **Analog Board 2**

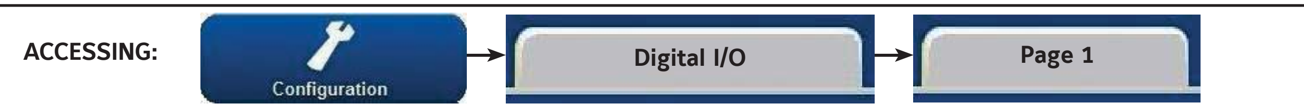
I/O Channel - This will show the Output channel (with regard to the I/O Board selection) that the retransmit function will be assigned to.

CONFIGURATION

Digital I/O



ACCESSING:



DESCRIPTION: The Digital I/O screens are used to view and set the Digital Input and Output assignments, and should be used anytime a Digital I/O point needs to be configured. Each screen consists of the same layout, with the exception of the I/O point name:

I/O Point - See the list below for each page.

I/O Board - A pop-up menu provides for the following selection for the I/O board:

None
Digital Board 1
Digital Board 2

I/O Channel - This will show the Digital I/O channel (with regard to the I/O Board selection) that the I/O point will be assigned to.

Status - This is an informational box which shows the On/Off status for the I/O point.

The following list shows the I/O point assignments for each page:

PAGE 1

Compressor Start Run
Compressor Confirmed Running
Oil Pump 1 Start Run
Oil Pump 1 Confirmed Running
Capacity Slide Load
Capacity Slide Unload
Volume Slide Increase
Volume Slide Decrease
Liquid Injection Oil Cooling
High VI Liquid Injection Oil Cooling
Economizer
Balance Piston

PAGE 2

Oil Level OK
High Liquid Level From System
Shunt Trip Output
Hot Gas Bypass
Remote Start Run Stop
Permissive Start
Oil Heater
Alarm
Shutdown
Power Assist
Ready To Run
Remote Enabled

PAGE 3

Recylce Delay Force Unload
Remote Load Capacity Slide
Remote Unload Capacity Slide
Oil Pump 2 Start
Oil Pump 2 Running
Capacity Mode Select Module A



Capacity Mode Select Module B
DX Circuit A
DX Circuit B

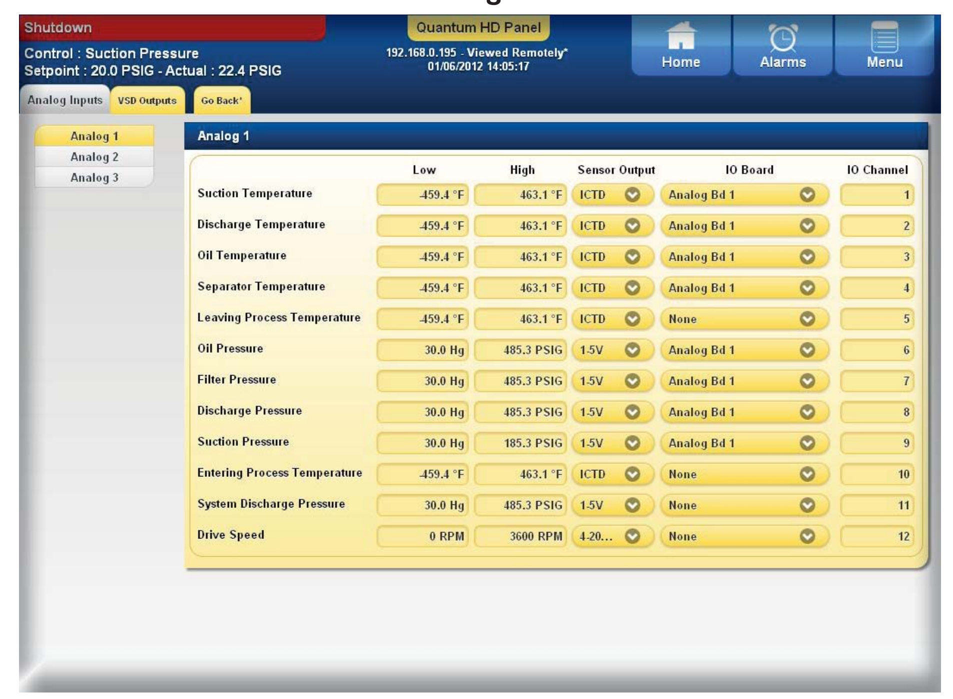
PAGE 4

Condenser Control Step 1
Condenser Control Step 2
Condenser Control Step 3
Condenser Control Step 4
Chiller Pump Start Run
Panel Heater
Main Oil Injection
Liquid Level Increase
Liquid Level Decrease
PLC Interlock
Discharge Butterfly Valve



CONFIGURATION

Analog I/O





DESCRIPTION: The Analog I/O screens are used to view and set the Analog Input and Output sensor ranges, sensor type and board/channel assignments, and should be used anytime an Analog I/O point needs to be configured. Each screen consists of the same layout, with the exception of the I/O point name:

ANALOG 1 (2, 3)

I/O Point - See the list below for each page.

Low - Enter the low end range that the sensor is capable of reading here.

High - Enter the high end range that the sensor is capable of reading here.

Sensor Output - A pop-up menu provides for the following selection for sensor types:

- 0-5V
- 1-5V
- 4-20mA
- ICTD
- 0-20mA
- 0-10V
- 2-10V

I/O Board - A pop-up menu provides for the following selection for the I/O board:

- None
- Analog Bd 1
- Analog Bd 2

I/O Channel - Enter the I/O Channel (with regard to the I/O Board selection) that the I/O point will be assigned to.

The following list shows the I/O point assignments for each page:

ANALOG 1

Suction Temperature
Discharge Temperature
Oil Temperature
Separator Temperature
Leaving Process Temperature
Oil Process
Filter Pressure
Discharge Pressure
Suction Pressure
Entering Process Temperature
System Discharge Pressure
Drive Speed

ANALOG 2

Economizer Pressure
Capacity Slide
Volume Slide
Motor Amps



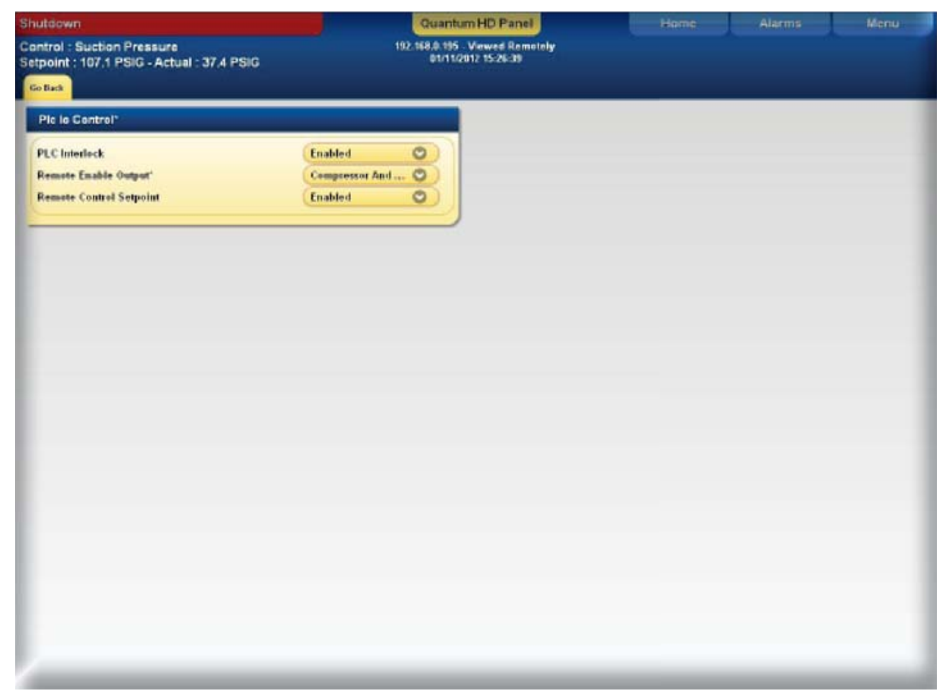
EZ Cool LIOC Feedback
Remote Slide Valve Position
Remote Control Setpoint
Engine Manifold Pressure
Balance Piston Pressure
Main Oil Injection
KW Monitoring
Relative Humidity

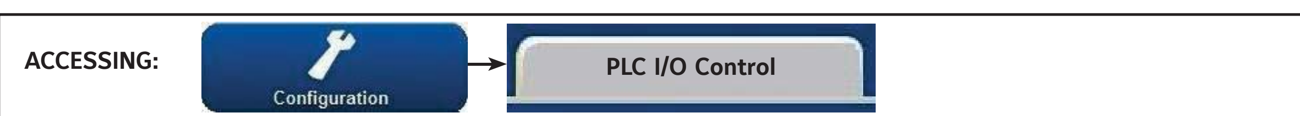
ANALOG 3

Outside Ambient Air Temperature
Vyper Coolant Temperature
Evaporator Liquid Level

CONFIGURATION

PLC I/O Control





DESCRIPTION: Use this screen to setup the PLC I/O Control features that can optionally be used.

The following selections appear here:

PLC Interlock – When enabled, this will determine Slide Valve control. If an input module has been installed into position #1 of Digital Board 2, it will be used to determine PLC Control. If the input signal is lost, the mode is switched to Automatic. The input must be energized before going into Remote.

Remote Enable Output – The output for channel 2, digital board 2 (Remote Enable) will be energized when the Compressor Mode has been set for Remote operation, and one of the following parameters have been selected:

- **Disabled** – This feature is disabled.
- **Compressor Mode: Remote I/O**
- **Compressor and Capacity Modes: Remote I/O**
- **Compressor Mode: Remote I/O and Capacity Mode: Remote 4-20**

Remote Control Setpoint - This provides for using the Remote Control Setpoint analog input (channel 12) for Capacity Control of compressors. A pull down box is provided that changes between the following selections:

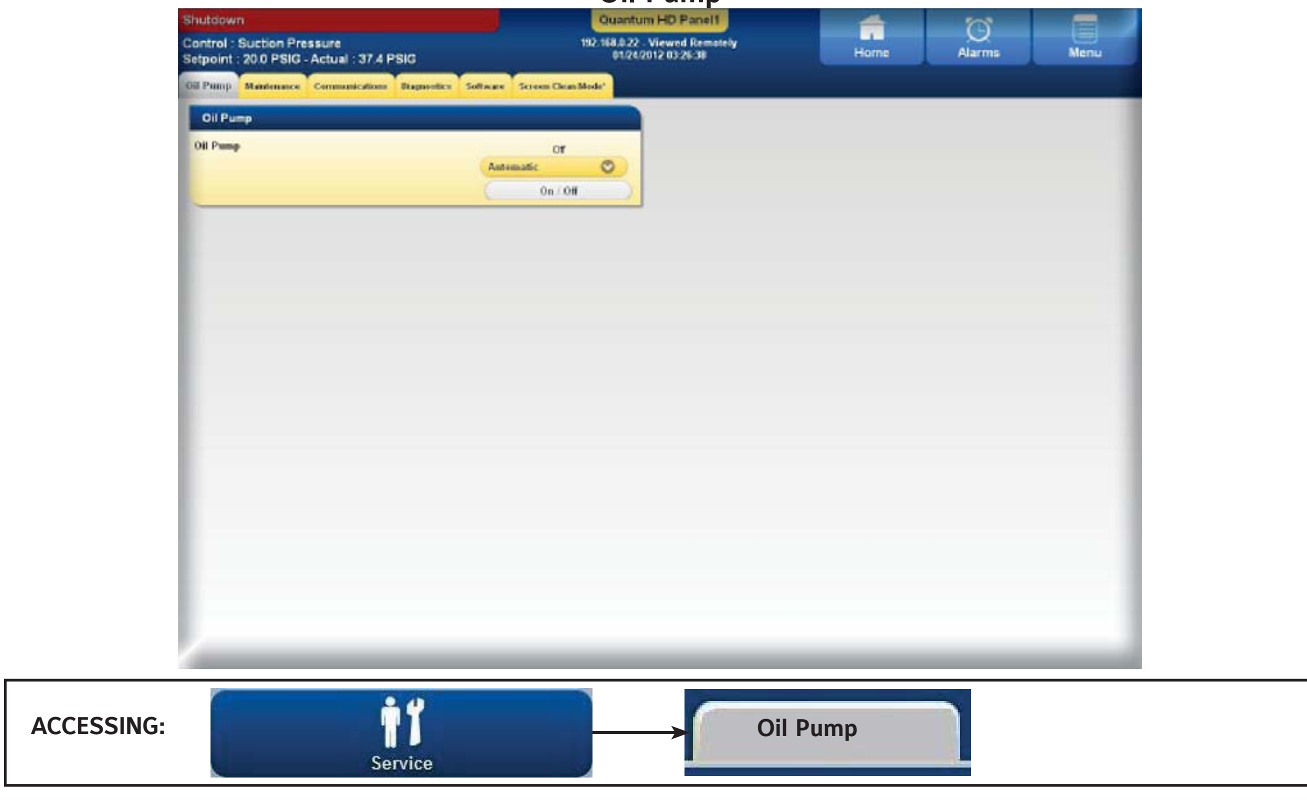
- **Disabled** – This feature is disabled.
- **Enabled** – This feature is enabled.



SERVICE

Oil Pump





ACCESSING: Service → Oil Pump

DESCRIPTION: Using this screen, the user can set the operation of the Oil Pump, if installed.

OIL PUMP

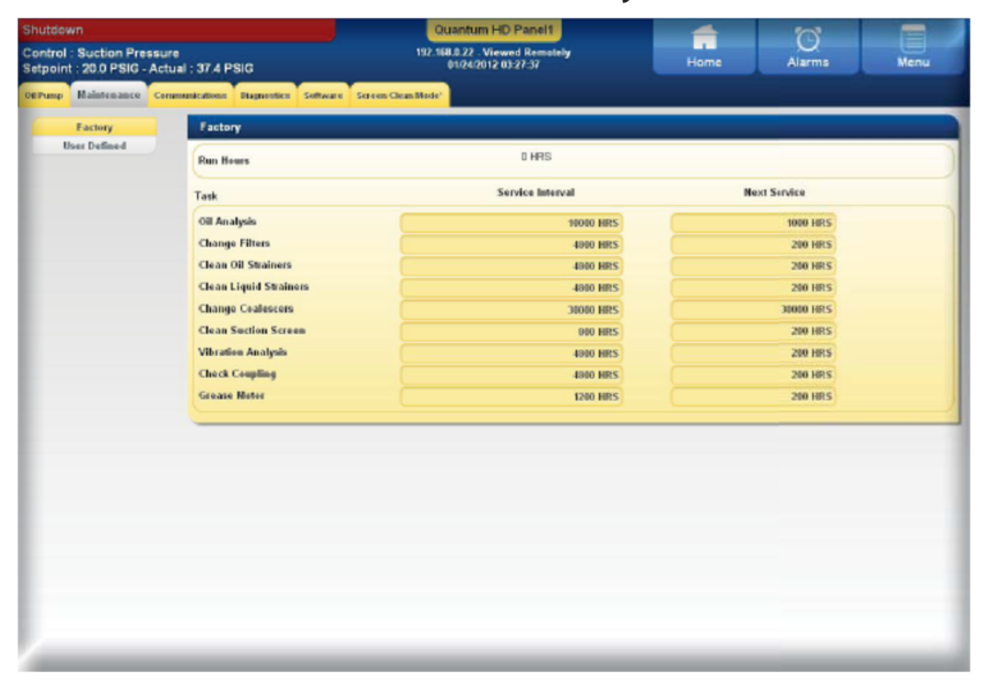
Oil Pump - A Pump On/Off indicator (blue text) is provided here to alert the user as to the actual status of the Oil Pump (if applicable). A drop down menu is also provided, and there are two states that can be selected for oil pump operation, they are:

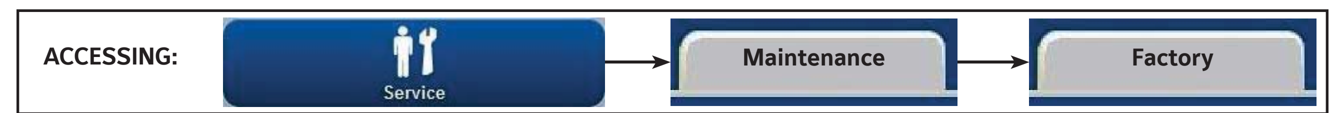
Manual - The user has control over the running of the pump. To run the pump, simply observe the blue text indicator to ensure that the pump is not already running, and if not, then press the **[On/Off]** toggle button. The blue text indicator will change from Off to On. To stop the pump, press the toggle button again, and the pump indicator will change to Off.

Automatic - If the pump is set to Automatic mode, the Quantum™ HD software program is controlling the pump operation. In this mode, if the toggle key is pressed, the mode will be changed from Automatic to Manual Mode, and the current state of the pump (digital output 3) will toggle also.

SERVICE

Maintenance (Factory)





DESCRIPTION: Using this screen, the user can view up to nine (9) pre-programmed maintenance schedules. This screen is based upon the Maintenance Schedule that is provided in the IOM manual for the specific compressor package.

FACTORY

The above screen shows a row labeled as Oil Analysis in the Task column. The next column (Service Every) on the same row has a value of 10000 Hrs. The last column (Next Service) of this row has a value of 1000 Hrs. When the compressor is running, this time value is being clocked. After 1000 hours of compressor run time, a message will be generated and placed on the Event screen. This particular message will read Maintenance -- Oil Analysis. This is to notify the operator that it is time to have the Oil checked. At this point, the operator should notify the proper maintenance personnel that the appropriate maintenance be performed. The user should access the Event Screen on a regular basis (perhaps once per week) to review the information provided there.

Once the message has been entered in the Event Log, the values for the row will be automatically updated, with new values as predetermined by an internal programmed maintenance schedule, based upon the type of compressor. The values for the Next Service column are based upon the Compressor Run Time hours (shown at the top of this screen).

Modifying numerical values

When using the touchscreen, simply touch the box that you wish to change, and enter the new value into the setpoint box, then press **[Enter]**.

When using the physical keypad, simply use the **[Tab]** key to scroll down the lists, or the **[Left Arrow]** key to scroll up the lists. When the box that you wish to change is highlighted, you may enter the new value using the numerical keys, then press the **[Enter]** key to accept the value.

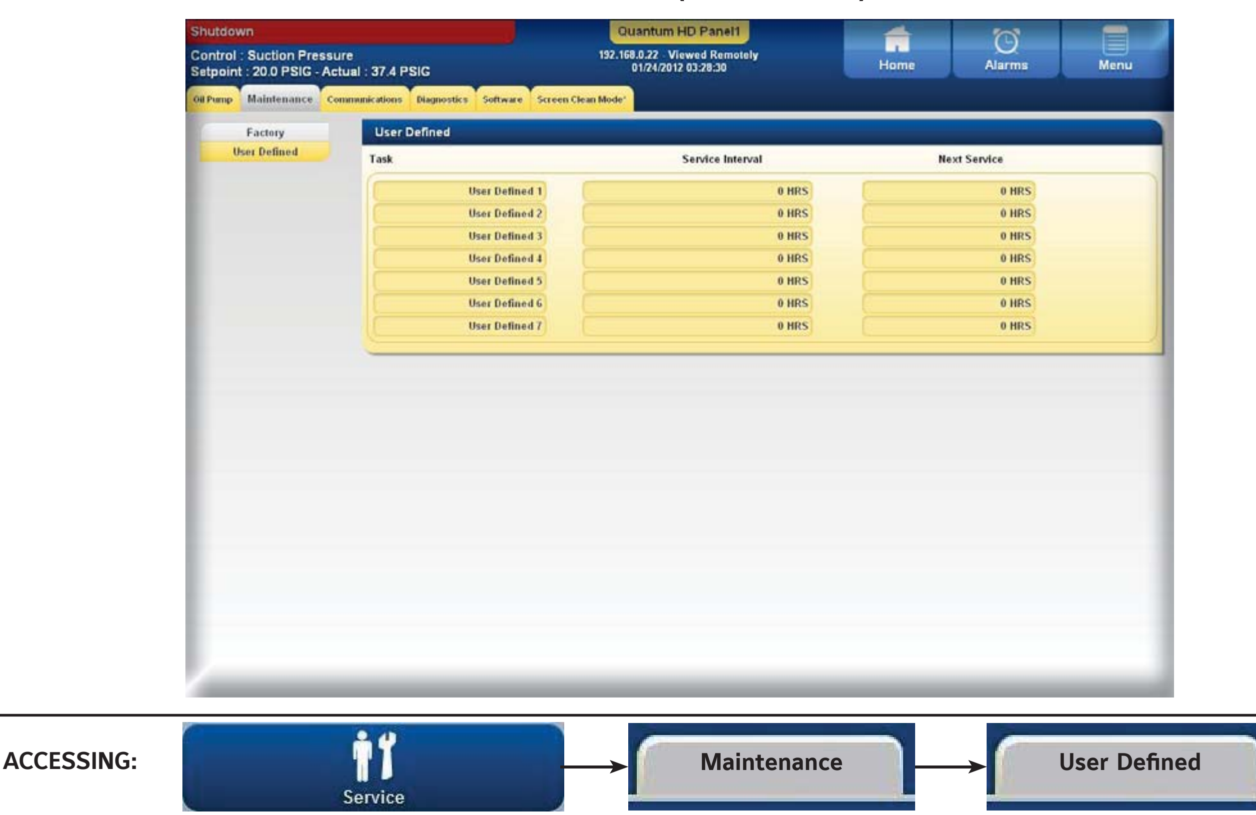
The following additional information is provided on this screen:

Run Hours - The value shown here is the total number of hours that the compressor motor has actually been in the running state. This value can be reset (or changed to any value from 0 to 1,000,000 Hours) from the Panel screen.



SERVICE

Maintenance (User Defined)



ACCESSING: Service → Maintenance → User Defined

DESCRIPTION: Using this screen, the user can view up to eight (8) user definable maintenance schedules. Each of the user defined schedules may be custom named. This screen is based upon the Maintenance Schedule that is provided in the IOM manual for the specific compressor package.

The function of this screen is exactly the same as already described on the previous page (Maintenance - Factory), with the exception that the user can custom name events here.

USER DEFINED

Modifying numerical values

When using the touchscreen, simply touch the box that you wish to change, and enter the new value into the setpoint box, then press **[Enter]**.

When using the physical keypad, simply use the **[Tab]** key to scroll down the lists, or the **[Left Arrow]** key to scroll up the lists. When the box that you wish to change is highlighted, you may enter the new value using the numerical keys, then press the **[Enter]** key to accept the value.

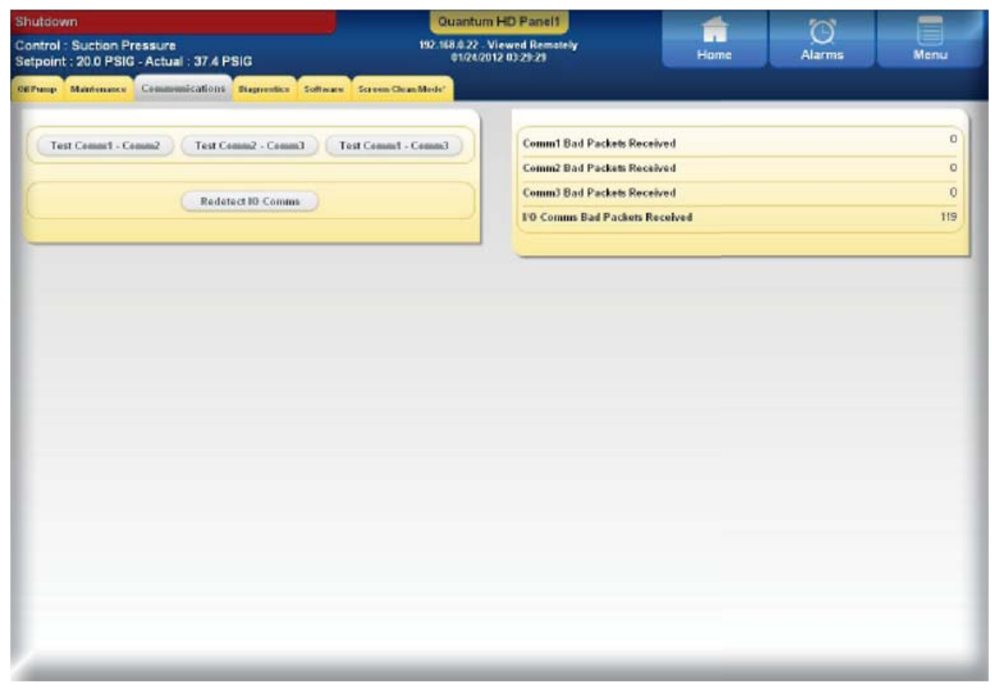
Modifying Text (User Defined) Boxes

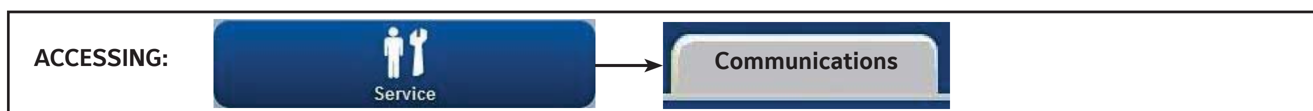
When using the touchscreen, simply touch the box that you wish to change, and enter the new name using the pop-up keyboard, then press **[Enter]**.

To modify any of the text boxes on this screen, simply use the **[Tab]** key to scroll down the lists, or the **[Left Arrow]** key to scroll up the lists. Once the box that you wish to change is highlighted, use the **[Up Arrow]** key. A new screen (Alpha) showing a numerical keypad will appear. Refer to the Alpha screen description for information on entering text messages. Press the **[Enter]** key to accept the text. The user may type in a custom name up to 20 characters long.

SERVICE

Communications





DESCRIPTION: This screen allows the technician to perform system checks on serial communications. Please refer to Section 2 of Frick publications 090.040-CS (Communications Setup) for additional information.

The following buttons are provided:

- **Test Comm1 - Comm2** - This test will check the hardware of both of theses ports.
- **Test Comm2 - Comm3** - This test will check the hardware of both of theses ports.
- **Test Comm 3 - Comm1** - This test will check the hardware of both of theses ports.
- **Redetect I/O Comms** - This selection provides a method to detect all connected Analog and Digital boards. For additional information about this screen, refer to 090.040-CS (Communications Manual).

  The following are some of the things that can occur that would cause an I/O board to stop communicating with the Quantum™, and would require that you Redetect I/O Comms:

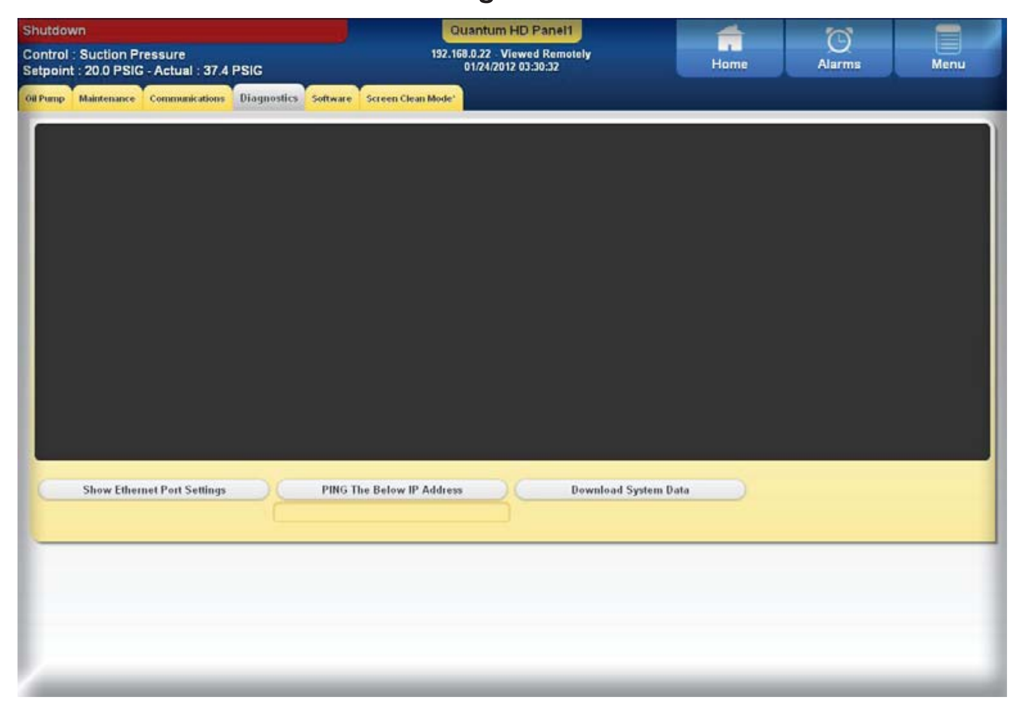
  - A board has been removed, and power was turned on with the board removed. You would need to replace the board, re-power, and then select **[Redetect I/O Comms]**.
  - A board has failed in such a way that it cannot properly communicate with the Quantum™ HD.
  - A failure with the communications cable which is plugged into the end of each board

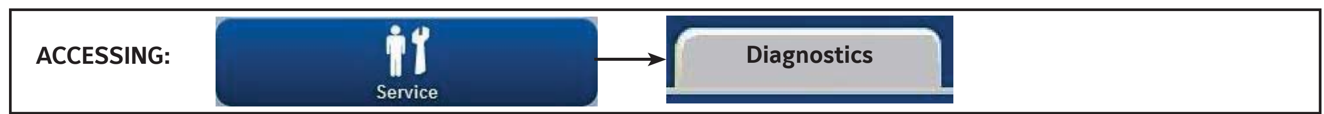
If any of these things occur, a communications error shutdown will be issued until this key is selected. You should always view the *About* screen to see what has been detected.



SERVICE

Diagnostics





DESCRIPTION: This screen allows the technician to perform system checks on Ethernet communications. Refer to the Communications Manual (090.040-CS) for specific information about this test.

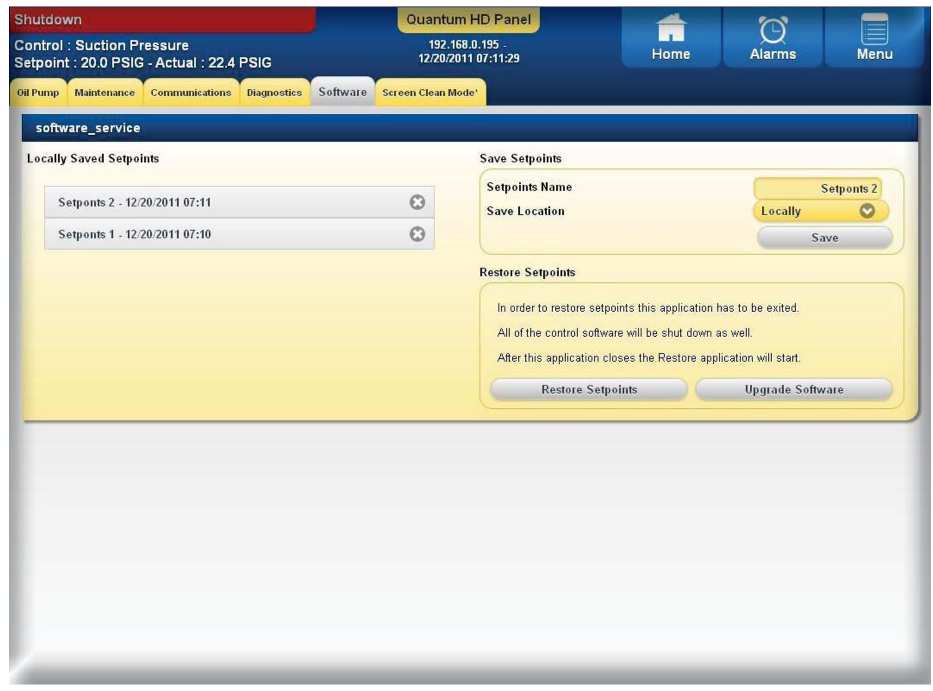
- **Show Ethernet Port Settings** - Pressing this button will cause the Ethernet Port Settings to be shown.

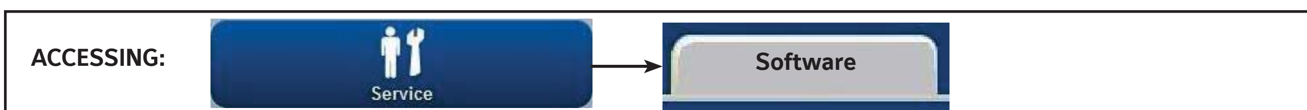
- **Ping the Below IP Address** - There is a setpoint box located below this button. Select this box to call up a numeric keypad. Enter the IP address that you wish to PING, then press the **[PING The Below Address]** button. The results of the PING will be shown.

- **Download System Data** -

SERVICE

Software





DESCRIPTION: The Software Maintenance screen has been provided as a way for the user to upload new operating software to their system, save setpoints or restore setpoints.

SOFTWARE SERVICE

Locally Saved Setpoints

Any previously saved setpoint data files will be shown here, by the file name that the user assigned to the file. The date and time stamp will be shown next to the file name.

To delete one or more files, simply click on the file name bar, and you will be prompted with a warning message that the file will be deleted.

Save Setpoints

Setpoint Name - Selecting this box will call up the keyboard overlay. Use the on-screen keyboard to enter a custom name for the setpoint file that you wish to create. When finished, press the **[Enter]** key on the keyboard. The on-screen keyboard will be removed, and you will see your custom named file in the Setpoint Name box. You will next need to select the location to save the setpoint data file to, by selecting *Save Location*.
Save Location - Selecting this button will cause the following options to be shown:

- **Locally** - Selecting this option will save the compressor setup locally to the panel.
- **USB Thumb Drive** - Select if Uploading from or Downloading to a USB thumb drive. Install the drive to one of the two USB ports of the Q5 processor board.

NOTE: Devices that are formatted using any of the following formats have been verified to function properly:

Windows:

- FAT32
- NTFS
- FAT

Linux:

- Linux ext2

Although numerous brands and storage sizes of USB thumb drive devices have been tested for compatibility with the Quantum™ HD system, there is a possibility that not all USB thumb drives will work.

Restore Setpoints

Restore Setpoints - Selecting this button will allow for a previously saved setpoints file, to restore (overwrite) the setpoint file that is currently contained within the Quantum™ HD.

Upgrade Software - Selecting this button will cause the an upgrade software version to in stalled to the Quantum™ HD.



NOTES:

SECTION 4

OPERATION OVERVIEW

INITIAL SETUP PROCEDURE

1. Compressor Configuration should be performed by a Factory Representative or Distributor to setup the customer specific control features which should not need to be changed by operators.

2. Configuration is performed to setup panel features and options, which can later be changed by an operator. Features such as the panel time, and screen saver are changed here. Options such as Condenser Control are enabled here. The operator can avoid viewing and entering settings of unused controls by keeping unused options disabled.

3. Calibrate the control devices.

4. Enter and setup all control settings.

5. Establish the desired access rights of the operators.

6. The Operating Status screen now provide quick access to the most important information and controls of the compressor unit and the subsystems.

COMPRESSOR START-UP PROCEDURE

- Starting is shown for the Compressor status on the Operating Status screen.

- All the safeties are checked. If any shutdown condition is present the corresponding alarm message is shown and the compressor is prevented from starting.

- If the compressor type has been set to Other Compressor:

  - The oil lubrication is checked. A Prelube pump needs a 5 lb. oil pressure differential to allow the compressor to start. A full time pump needs a 20 lb. Oil Pressure differential to allow the compressor to start. Other compressor manufacture's Oil Pumps needs a 30 lb. Oil Pressure differential to allow the compressor to start. If one of these conditions is not present an alarm message is issued and the compressor is prevented from starting.

- The Slide Valve position is checked to see if it is less than or equal to the Highest Slide Valve Position to allow starting the compressor setpoint. If the Slide Valve position is higher than this, the compressor is prevented from starting.

- If none of the above conditions has prevented the compressor from starting, a timer delay is started that requires the starting conditions to remain satisfied for a period of five seconds for all compressor model types except **[Other Compressor Manuf]**. The Other compressor model type uses a 20 seconds delay. After the time delay the compressor and the Recycle Delay timer are started.

- If within 30 seconds, the Compressor Start Auxiliary input has not been energized, or Motor Current is not detected, then an alarm message is issued and the compressor is shut down.

- When the compressor begins running, the Oil Pressure values are in a state of change. For a period of 10 seconds after the compressor status switches to Running, the low Oil Pressure alarm and shutdown safeties are ignored.

COMPRESSOR STOPPING PROCEDURE

During the compressor stopping, the Slide Valve unload solenoid remains energized until the Slide Valve is unloaded to or below the Highest slide valve position to allow starting the compressor setpoint. If the Slide Valve does not unload below this setpoint within 5 minutes, the alarm message Compressor Unable to Unload - Alarm is issued.



SETUP FOR AUTOMATIC CONTROL

In order to operate a compressor at peak efficiency, under full load and part load conditions complex control sequences must be used. In order to obtain the efficiencies, Automatic Control is almost mandatory. Automatic control of the Slide Stop and Slide Valve increases the compressor efficiency over a wide operating range. The following steps (which are relevant) should be taken to control in Automatic:

- The compressor should be in automatic (automatic cycling) so the compressor will start and stop according to the Autocycle setpoints.
- The Oil Pump should be in auto because its operation coincides with that of the compressor.
- The Slide Valve and the Slide Stop should be in Automatic so they are controlled by setpoints and internal control logic.

Note: If there is a shutdown in response to a safety setting, a compressor in Automatic mode is placed into Manual mode requiring operator intervention.

REMOTE CONTROL OF THE COMPRESSOR

The following digital outputs and inputs (on Digital Board 2) have been provided that can be used to control the compressor from another controller such as a PLC:

- **(Module 1) - Ready to Run** - This output is energized while the compressor is not shutdown and the Recycle Delay has timed out.
- **(Module 2) - Remote Enabled** - This output is energized while the compressor is in Remote Start mode.
- **(Module 3) - Remote Start / Run / Stop** - If the compressor is in Remote Start mode with no Recycle Delay time and this input is energized, the compressor is started. If this input is energized and the compressor is started, it will continue to run. If this input is de-energized, the compressor is stopped.
- **(Module 4) - Remote Load or Remote C.C step 1 for step units**
    - **Remote Load** - If the Slide Valve is in Remote Mode and this input is energized, the Slide Valve load solenoid will be energized provided there are no safety overrides preventing loading.
    - **Remote C.C step 1 for step units** - If the Capacity Mode is in Remote this input is used to step on and off capacity according to the Remote Capacity Control chart.
- **(Module 5) - Remote Unload or Remote C.C step 2 for step units**
    - **Remote Unload** - If the Slide Valve is in remote and this input is energized, the Slide Valve unload solenoid will be energized.
    - **Remote C.C step 2 for step units** - If the Capacity Mode is in Remote this input is used to step on and off capacity according to the Remote Capacity Control chart.

Remote Capacity Control Chart

Input \ %Capacity	25	50	75	100
3-Step Input 4		OFF	OFF	ON
3-Step Input 5		OFF	ON	ON
4-Step Input 4	OFF	ON	OFF	ON
4-Step Input 5	OFF	OFF	ON	ON

- **(Module 6) Recycle Delay** (If compressor is off) - This output is energized while the remaining time in minutes for Recycle Delay is greater than zero (0). Recycle delay time is the time that must elapse prior to allowing the compressor to restart. This timer times out while the compressor is running or stopped since the Recycle Delay is a start-to-start protection. It is intended to prevent damage to the motor from successive restarts. For further setup see the Motor Control Setpoints screen
- **Sequence Input** (If compressor is on) – Reports the status of Stop Load or Force Unload (See Slide Valve and Slide Stop Status box for further details).

The Hot Gas Bypass option can be used. This option is not available for all compressor models (Reference 090.040-M; Compressor Model Differences).

The Remote Control Setpoint option can be used. This option, which is enabled in Panel Setup, is not available for all compressor models (Reference Compressor Model Differences). This uses the Remote Control Setpoint analog input and the Remote Control Setpoint analog output for Capacity Control of compressors. For further setup see the Calibrate Remote Control Setpoint screen and the **[Remote Setpoint]** command key from the Slide Valve Mode screen command keys on the Operating Status screen.

The Remote Slide Valve Position option can be used. This option which is enabled in Panel Setup is not available for all compressor models (Reference Compressor Model Differences). This uses a (4-20 ma) input signal to the Remote Slide Valve Position analog input (Channel #13 on Analog Board #1) to control the Slide Valve. For further setup see the Calibrate Slide Valve Position screen and the **[Remote Slide Valve]** command key from the Slide

Valve Mode screen command keys on the Operating Status screen.

The Slide Valve Position \ Capacity analog output can be used to determine the present Slide Valve position % or Capacity % dependent on the compressor model (Reference Compressor Model Differences). A (4-20 ma) output signal to the Slide Valve Position \ Capacity analog output (Channel #3 on Analog Board #1) corresponds to the present (%) value displayed on the Operating Status screen.

ASCII communication to the Com-2 port can be used (reference 090.040-CS Communications Setup manual). A compressor should be in both Remote Compressor Mode and Remote Slide Valve or Capacity Mode for Remote Control.

Note 1: If the compressor is in Remote mode and communication through the communication port has not occurred for 5 minutes, then the compressor is placed into Automatic mode and the Slide Valve is placed into Auto mode.

Note 2: If there is a shutdown in response to a safety setting, a compressor in Remote mode is placed into Manual mode requiring operator intervention.

When a Shutdown occurs, the display backlight will flash on and off to alert an operator of the shutdown. This visual warning will help get the attention of the operator in a noisy engine room environment where audible alarms may not be heard. Pressing any key on the keypad will clear the flashing backlight.

NOTE: refer to 100-200/210 IOM for further VSD (Vyper™) message details.



NOTES:

SECTION 5

WARNINGS/SHUTDOWNS MESSAGES

Following is the alphabetical listing of all the possible conditions:

Analog Board 1 Communications Shutdown - It has been detected that the program is no longer able to communicate to Analog Board 1.

Analog Board 2 Communications Shutdown - It has been detected that the program is no longer able to communicate to Analog Board 2.

Auxiliary Input 1-20 Shutdown - The Auxiliary #1-20 input module has been setup to indicate a shutdown if it becomes de-energized.

Auxiliary Input 1-20 Warning - The Auxiliary #1-20 input module has been setup to indicate a warning if it becomes de-energized.

Balance Piston 1 Shutdown - Balance piston control has been enabled. This shutdown will occur if the difference between Discharge Pressure and Suction Pressure is less than 60 PSI and the Balance Piston output module (digital output module 12) is de-energized, then the Balance Piston pressure must be 1.1 times Suction Pressure plus or minus 15 PSI.

Balance Piston 2 Shutdown - Balance piston control has been enabled. This shutdown will occur if the difference between Discharge Pressure and Suction Pressure is greater than or equal to 60 PSI and the Balance Piston output module (digital output module 12) is de-energized, then the Balance Piston pressure must be 50 PSI below Discharge Pressure plus or minus 15 PSI.

Balance Piston 3 Shutdown - Balance piston control has been enabled. This shutdown will occur if the Balance Piston output module (digital output module 12) is energized, then Balance Piston pressure must be within 20 PSI of Oil Pressure.

Coalescer Filter Differential Shutdown – (For RCSI only) A Shutdown will be occur when the differential of Discharge Pressure to System Discharge Pressure is greater than the setpoint for its Delay period.

Coalescer Filter Differential Warning – (For RCSI only) This Warning will be issued when the differential of Discharge Pressure to System Discharge Pressure is greater than the setpoint for its Delay period.

Compressor Auxiliary Shutdown - This shutdown message is issued if while the compressor is running and the Compressor Auxiliary input module, which receives feedback from the motor starter, becomes de-energized.

Compressor Capacity Unload Warning - While stopping the compressor or if the compressor is off, this indicates that the Slide Valve position has not unloaded below the Highest Slide Valve Position to allow starting the compressor setpoint.

Compressor Starting Failure-Aux. - This shutdown message is displayed if after 30 seconds from the time the start compressor command is sent the Compressor Auxiliary input module is not energized.

Condensing Water in Separator Warning (Off) – When the compressor is off, if the Separator Temperature was less than the sum of the calculated Dewpoint Temperature and the Off Safety Factor for the Delay period.

Condensing Water in Separator Warning (Running) – When the compressor is running, if the Discharge Temperature was less than the sum of the calculated Dewpoint Temperature and the On Safety Factor for the Delay period.

DBS Communication Failure Warning – It has been detected that the program is no longer able to communicate to a RAM DBS Motor Starter. To verify the loss in communications, access Menu > Setpoints > Motor, and check the DBS Software Version. This version should read the actual version of the software, but a communications loss will return a value of 0.00.

DBS Communication Failure Shutdown - It has been detected that the program is no longer able to communicate to a RAM DBS Motor Starter. To verify the loss in communications, access Menu > Setpoints > Motor, and check the DBS Software Version. This version should read the actual version of the software, but a communications loss will return a value of 0.00.

DBS - Current Unbalance – Either the current between two phases has exceeded the setpoint value longer than the time delay setpoint, or there is a voltage unbalance between phases, or the SCR operation is abnormal.

DBS – HEATSINK Over-temperature – Either the temperature of the heat sink has exceeded the maximum safe operating temperature of 85 deg. C. or heat sink cable



connection P2 is loose.

DBS – Jam – The current exceeded the Jam Trip level set point longer than the time delay set point while in the RUN state.

DBS - Phase Loss – This will occur if there is a loss of at least one phase of supply voltage or the loss of at least one phase of current feedback.

DBS - Phase Reversal – Either there is an incorrect phase order at the DBS chassis input terminals, or the control power was applied before the three phase power.

DBS - RTD Overtemperature –The RTD temperature sensor is out of range.

DBS - RTD Temperature – The RTD temperature sensor is out of range.

DBS - Short Circuit – The current exceeded 800% of FLA set point while the motor was starting.

DBS - Shorted SCR – This failure may occur if there is a defective SCR or a defective bypass contactor. It may also occur if the motor is disconnected. Also, inspect the main contacts of the bypass contactor.

DBS - Thermal Overload – Either the calculated thermal capacity of the motor exceeded 100% of limit, or the motor is "short-cycling".

Digital Board 1 Communications Shutdown - It has been detected that the program is no longer able to communicate to Digital Board 1.

Digital Board 1 Reset - If a reset of Digital Board 1 occurs, a shutdown will occur to prevent the motor from restarting.

Digital Board 2 Communications Shutdown - It has been detected that the program is no longer able to communicate to Digital Board 2.

Digital Board 2 Reset - If a reset of Digital Board 2 occurs, a warning will be issued.

False Running Fail -- Confirmed Running Inp - This shutdown message is issued if while the compressor is off the compressor auxiliary is energized. While this condition is present, the Oil Pump (if available) is on, and Liquid Injection (if available) is allowed on and the Slide Valve is unloaded to 0% to safeguard the compressor.

False Running Fail -- Motor Amps - This shutdown message is issued if while the compressor is off, the Motor Current reading is above the Low Motor Amps Shutdown setpoint. While this condition is present, the Oil Pump (if available) is on, and Liquid Injection (if available) is allowed on and the Slide Valve is unloaded to 0% to safeguard the compressor.

Harmonic Filter DC Bus Voltage Imbalance – The 1/2 DC link voltage magnitude will remain within ± 50VDC of the total DC link voltage divided by two during the precharge interval for both 60 and 50 Hz 519 filters. If not, the Quantum™ HD panel will display this message.

Harmonic Filter DC Current Transformer 1 – During initialization, the output voltage of DC Current Transformer 1 which sense the filter's input current will be monitored and compared against a level of ± 147 mv (± 6010 A to D counts). If the offset error falls outside this range, the unit will trip and the Quantum™ HD panel will display this message.

Harmonic Filter DC Current Transformer 2 – During initialization, the output voltage of DC Current Transformer 2 which sense the filter's input current will be monitored and compared against a level of ± 147 mv (± 6010 A to D counts). If the offset error falls outside this range, the unit will trip and the Quantum™ HD panel will display this message.

Harmonic Filter High Baseplate Temp Fault – The unit contains one heatsink assembly for the 305 Hp. The Filter's power module base plate temperature will feed the Harmonic Filter Logic board. This temperature is compared in software to a limit of 79°C and if this limit is exceeded, the unit will trip and the Quantum™ HD panel will display this message.

Harmonic Filter High DC Bus Voltage Fault – The harmonic filter's DC link voltage is continuously monitored and if the level exceeds a range of 822 to 900 VDC, a Filter Bus Over-Voltage shutdown is initiated.

Harmonic Filter High Phase A Current Fault – The unit's three phases of instantaneous output current are compared to a prescribed limit, which is contained in the hardware. If the Phase A signal exceeds the prescribed limit, the filter will be inhibited from operating by inhibiting the Current Regulator Run signal for five to six input line voltage cycles. If the Phase A signal exceeds the prescribed threshold three times in 60 line cycles, the unit will trip and the Quantum™ HD panel will display this message.

Harmonic Filter High Phase B Current Fault – The unit's three phases of instantaneous output current are compared to a prescribed limit, which is contained in the hardware. If the Phase B signal exceeds the prescribed limit, the filter will be inhibited from operating by inhibiting the Current Regulator Run signal for five to six input line voltage cycles. If the Phase B signal exceeds the prescribed threshold three times in 60 line cycles, the unit will trip and the Quantum™ HD panel will display this message.

Harmonic Filter High Phase C Current Fault – The unit's three phases of instantaneous output current are compared to a prescribed limit, which is contained in the hardware. If the Phase C signal exceeds the prescribed limit, the filter will be inhibited from operating by inhibiting the Current Regulator Run sig-

nal for five to six input line voltage cycles. If the Phase C signal exceeds the prescribed threshold three times in 60 line cycles, the unit will trip and the Quantum™ HD panel will display this message.

Harmonic Filter High Total Demand Distortion – This shutdown indicates that the filter is not operating correctly or the input current to the Vyper™ / filter system is not sinusoidal. This fault occurs when any of the three phases of Total Demand Distortion is greater than 25.0 %, for forty-five continuous seconds while the Vyper™ is running.

Harmonic Filter Input Frequency Out of Range - The Harmonic Filter monitors the line frequency on its inputs. If this frequency is out of range, it will cease filtering, and set a bit in the communications packet. This warning is shown whenever this bit is set.

Harmonic Filter Logic Board Power Supply – This shutdown indicates that one of the low voltage power supplies on the Filter Logic board have dropped below their permissible operating voltage range.

Harmonic Filter Logic Board Or Comms Fault – This fault occurs if the No Fault signal from the Vyper™ is low, indicating a fault is present at the Vyper™ or the Harmonic Filter, but the communications data contains no Harmonic Filter fault data for twenty seconds. The Frick Interface Board will send Initialize data requests while this fault is active.

Harmonic Filter Low DC Bus Voltage – The DC link voltage magnitude should remain within -80 VDC of the bus voltage setpoint determined from the peak input voltage. If the DC link voltage magnitude falls outside this range for 100 msec the unit will trip and the Quantum™ HD panel will display this message.

Harmonic Filter Phase Locked Loop Fault – This shutdown indicates that a circuit called a “phase locked loop” on the Filter Logic board has lost synchronization with the incoming power line for a period of time.

Harmonic Filter Precharge - High DC Bus Volt – The DC link voltage will reach at least 500 VDC within 20 seconds after the precharge signal has been asserted on the 60 Hz VSD and at least 414 VDC within 20 seconds on the 50 Hz VSD. If not, the Quantum™ HD panel will display this message.

Harmonic Filter Precharge - Low DC Bus Volt – This fault has two different timing events. First, the DC Bus voltage must be equal to or greater than 50 VDC for 60 Hz (41 VDC for 50 HZ) 4 seconds after precharge has begun. Second, the DC Bus voltage must be equal to or greater than 500 VDC for 60 Hz (414 VDC for 50 HZ) 20 seconds after precharge has begun. The unit is shut down and this message is generated if any of these conditions are not met.

Harmonic Filter Run Signal Fault – When a digital run command is received at the filter logic board from the Vyper™ Logic board, a 1/10 second timer is begun. A redundant run command must also occur on the serial data link from the Vyper™ Logic board before the timer expires. If not, the Vyper™ will be shut down and this Fault message will be displayed.

Harmonic Filter Serial Communication – When requesting Status data, the response data from the Harmonic Filter includes a bit that indicates whether communications were lost from the Vyper™ to the Harmonic Filter. If this bit is high for twenty consecutive seconds, this warning is indicated. This warning is also indicated whenever a receive timeout, or checksum fault is detected on the Harmonic Filter communications, for twenty continuous seconds.

Harmonic Filter 110% Input Current Overload – The overload threshold and timer functions reside in software on the Harmonic Filter’s Logic board. The unit’s three phases of RMS output current are compared to the overload threshold magnitude. If this threshold is exceeded for 40 seconds the unit will trip and the Quantum™ HD panel will display this message.

High Auxiliary Analog 1-20 Shutdown - The Auxiliary Analog #1-20 value was greater than or equal to the high Auxiliary Analog #1-20 shutdown setpoint for its time delay.

High Auxiliary Analog 1-20 Warning - The Auxiliary Analog #1-20 value was greater than or equal to the high Auxiliary Analog #1-20 warning setpoint for its time delay.

High Auxiliary Analog Input 1-20 Sensor Warning - This warning message is issued if the sensor connected to the associated Auxiliary Analog Input channel was above the High End range for its sensor. The High End range is set by accessing Menu > Calibration > Auxiliaries > Page 1 or 2, and setting the High end. This is strictly a warning, as the compressor does not stop. This warning is logged into the Event Log.

High Bal Piston Pressure Sensor Warning – This warning message is issued if the Balance Piston Pressure reading (analog board 1, channel 10) was to the upper or maximum range (out of range) for its sensor.

High Comp. Oil Pressure Sensor Fault - This shutdown message is issued if the Oil Pressure reading (analog board 1, channel 6) was to the upper or maximum range (out of range) for its sensor.

High Comp. Oil Pressure Shutdown – The Oil Pressure was greater than or equal to the High Oil Pressure Shutdown setpoint for its time delay.

High Comp. Oil Temperature Shutdown - The Oil Temperature was greater than or equal to the High Oil Temperature Shutdown setpoint for its time delay.

High Comp. Oil Temperature Warning - The Oil Temperature was greater than or equal to the High Oil Temperature Warning setpoint for its time delay. To access



this setpoint: Menu > Setpoints > Package.

High Compressor Vib Shutdown - Suction - If the Suction End Compressor Vibration sensor registers a reading that is higher than the value that has been set for the Suction End High Shutdown, for the period of time as set for the Suction End High Shutdown Delay, a Shutdown will be generated.

High Compressor Vib Warning - Suction - If the Suction End Compressor Vibration sensor registers a reading that is higher than the value that has been set for the Suction End High Warning, for the period of time as set for the Suction End High Warning Delay, a Warning will be generated.

High Compressor Vib Shutdown - Discharge - If the Discharge End Compressor Vibration sensor registers a reading that is higher than the value that has been set for the Discharge End High Shutdown, for the period of time as set for the Discharge End High Shutdown Delay, a Shutdown will be generated.

High Compressor Vib Warning - Discharge - If the Discharge End Compressor Vibration sensor registers a reading that is higher than the value that has been set for the Discharge End High Warning, for the period of time as set for the Discharge End High Warning Delay, a warning will be generated.

High Disch Pres Shutdown - The Discharge Pressure was greater than or equal to the active High Discharge Pressure Shutdown setpoint for its time delay.

High Disch Pres Warning - The Discharge Pressure was greater than or equal to the active High Discharge Pressure Warning setpoint for its time delay.

High Disch Pres Shutdown -- Mode 2 –The Discharge Pressure was greater than or equal to the active High Discharge Pressure Shutdown setpoint for its time delay.

> **NOTE:** This message can only be active if Dual Discharge Pressure Mode is enabled. Also, if the Dual Mode is enabled, then the Mode 1 safeties are active for Modes 1 & 3, and the Mode 2 safeties are active for Modes 2 & 4.

High Disch Pres Warning -- Mode 2 - The Discharge Pressure was greater than or equal to the active High Discharge Pressure Warning setpoint for its time delay.

> **NOTE:** This message can only be active if Dual Discharge Pressure Mode is enabled. Also, if the Dual Mode is enabled, then the Mode 1 safeties are active for Modes 1 & 3, and the Mode 2 safeties are active for Modes 2 & 4.

High Discharge Pressure Sensor Fault - This shutdown message is issued if the Discharge Pressure reading (analog board 1, channel 8) was to the upper or maximum range (out of range) for its sensor.

High Discharge Temperature Sensor Fault - This shutdown message is issued if the Discharge Temperature reading (analog board 1, channel 2) was to the upper or maximum range (out of range) for its sensor.

High Disch Temperature Sensor Warning – This warning message is issued if the Discharge Temperature reading (analog board 1, channel 2) was to the upper or maximum range (out of range) for its sensor.

High Discharge Temperature Shutdown - The Discharge Temperature was greater than or equal to the High Discharge Temperature Shutdown setpoint for its time delay.

High Discharge Temperature Warning - The Discharge Temperature was greater than or equal to the High Discharge Temperature Warning setpoint for its time delay.

High Economizer Gas Temp Sensor Warning – This warning message is issued if the Economizer Gas Temperature reading was to the upper or maximum range (out of range) for its sensor.

High Economizer Pressure Sensor Warning – This warning message is issued if the Economizer Pressure reading (analog board 2, channel 14) was to the upper or maximum range (out of range) for its sensor.

High Filter Pressure Sensor Warning – This warning message is issued if the Filter Pressure reading (analog board 1, channel 7) was to the upper or maximum range (out of range) for its sensor.

High Kw Monitoring Sensor Warning – This warning message is issued if the Kilowatt Monitoring reading (analog board 2, channel 16) was to the upper or maximum range (out of range) for its sensor.

High Limit Disch Pres Shutdown - The Discharge Pressure was greater than or equal to the active High Discharge Pressure Shutdown setpoint for its time delay.

High Limit Disch Temp Shutdown - The Discharge Temperature was greater than or equal to the active High Discharge Temperature Shutdown setpoint for its time delay.

High Liquid Level Sensor Warning – This warning message is issued if the Liquid Level reading was to the upper or maximum range (out of range) for its sensor.

High Liquid Level Shutdown – If the Liquid Level rises above the Liquid Level sensor, a delay timer is started. If the Level does not recover before the delay timer counts down, a Shutdown is issued.

High Main Oil Inj Pressure Sensor Warning – This warning message is issued if the Main Oil Injector Pressure reading (analog board 2, channel 15) was to the upper or maximum range (out of range) for its sensor.

High Manifold Pressure Sensor Warning – This warning message is issued if the Manifold Pressure reading was to the upper or maximum range (out of range) for its sensor.

High Manifold Pressure Shutdown - This shutdown applies if Engine Drive was enabled. When the Manifold Pressure exceeds this setpoint, an alarm will occur.

High Manifold Pressure Warning - This warning applies if Engine Drive was enabled. When the Manifold Pressure exceeds this setpoint, a warning will occur.

High Motor Current Sensor Warning – This warning message is issued if the Motor Current reading (analog board 1, channel 16) was to the upper or maximum range (out of range) for its sensor.

High Motor Current Shutdown - The motor amps was greater than or equal to the High Motor Amps Shutdown setpoint for its time delay.

High Motor Current Warning - The Motor Amps was greater than or equal to the High Motor Amps Warning setpoint for its time delay.

High Motor Stator #1 Temp Warning – If Motor Stator #1 temperature sensor registers a reading that is higher than the value that has been set for the Motor Stator #1 Temp. Warning, for the period of time as set for the Motor Stator #1 Temp. Warning Delay, a warning will be generated. The default values for these setpoints Default setpoints for this Warning are 302° F and 5 seconds.

High Motor Stator #1 Temp Shutdown – If Motor Stator #1 temperature sensor registers a reading that is higher than the value that has been set for the Motor Stator #1 Temp. Shutdown, for the period of time as set for the Motor Stator #1 Temp. Shutdown Delay, a Shutdown will be generated. The default values for these setpoints are 311° F, and 5 seconds.

High Motor Stator #2 Temp Warning – If Motor Stator #2 temperature sensor registers a reading that is higher than the value that has been set for the Motor Stator #2 Temp. Warning, for the period of time as set for the Motor Stator #2 Temp. Warning Delay, a warning will be generated. The default values for these setpoints 302° F, and 5 seconds.

High Motor Stator #2 Temp Shutdown – If Motor Stator #2 temperature sensor registers a reading that is higher than the value that has been set for the Motor Stator #2 Temp. Shutdown, for the period of time as set for the Motor Stator #2 Temp. Shutdown Delay, a Shutdown will be generated. The default values for these setpoints are 311° F, 5 seconds.

High Motor Stator #3 Temp Warning – If Motor Stator #3 temperature sensor registers a reading that is higher than the value that has been set for the Motor Stator #3 Temp. Warning, for the period of time as set for the Motor Stator #3 Temp. Warning Delay, a warning will be generated. The default values for these setpoints are 302° F, and 5 seconds.

High Motor Stator #3 Temp Shutdown – If Motor Stator #3 temperature sensor registers a reading that is higher than the value that has been set for the Motor Stator #3 Temp. Shutdown, for the period of time as set for the Motor Stator #3 Temp. Shutdown Delay, a Shutdown will be generated. The default values for these setpoints are 311° F, and 5 seconds.

High Motor Temp Shutdown - Opp Shaft Side – The motor has temperature sensors that monitor the Opposite Shaft Side bearing. If the temperature of this bearing exceeds the Opposite Shaft Side High Shutdown setpoint, for a period of time exceeding the Opposite Shaft Side High Shutdown Delay setpoint, this Shutdown will occur. The default values for these setpoints are 221° F and a delay of 5 seconds.

High Motor Temp Shutdown - Shaft Side – The motor has temperature sensors that monitor the Shaft Side bearing. If the temperature of this bearing exceeds the Shaft Side High Shutdown setpoint, for a period of time exceeding the Shaft Side High Shutdown Delay setpoint, this Shutdown will occur. The default values for these setpoints are 221° F and a delay of 5 seconds.

High Motor Temp Warning - Opp Shaft Side – The motor has temperature sensors that monitor the Opposite Shaft Side bearing. If the temperature of this bearing exceeds the Opposite Shaft Side High Warning setpoint, for a period of time exceeding the Opposite Shaft Side High Warning Delay setpoint, this Warning will occur. The default values for these setpoints are 203° F and a delay of 5 seconds.

High Motor Temp Warning - Shaft Side – The motor has temperature sensors that monitor the Shaft Side bearing. If the temperature of this bearing exceeds the Shaft Side High Warning setpoint, for a period of time exceeding the Shaft Side High Warning Delay setpoint, this Warning will occur. The default values for these setpoints are 203° F and a delay of 5 seconds.

High Motor Vib Shutdown - Opposite Shaft Side - If the Opposite Shaft Side Drive Vibration sensor registers a reading that is higher than the value that has been set for the Opposite Shaft High Shutdown, for the period of time as set for the Opposite Shaft High Shutdown Delay, a Shutdown will be generated. The default values for these setpoints are 10 Fg and a delay of 1 second.

High Motor Vib Shutdown - Shaft Side - If the Shaft Side Drive Vibration sensor registers a reading that is higher than the value that has been set for the Shaft Side High Shutdown, for the period of time as set for the Shaft Side High Shutdown Delay, a Shutdown will be generated. The default values for these setpoints are 10 Fg and a delay of 1 second.

High Motor Vib Warning - Opposite Shaft Side - If the Opposite Shaft Side Drive Vibration sensor registers a reading that is higher than the value that has been set for the Opposite Shaft High Warning, for the period of time as set for the Opposite Shaft High Warning Delay, a warning will be generated. The default values for these setpoints are 3.5 Fg and a delay of 99 seconds.



High Motor Vib Warning - Shaft Side - If the Shaft Side Drive Vibration sensor registers a reading that is higher than the value that has been set for the Shaft Side High Warning, for the period of time as set for the Shaft Side High Warning Delay, a warning will be generated. The default values for these setpoints are 3.5 Fg and a delay of 99 seconds.

High Oil Filter Pressure Shutdown - The Oil Filter Pressure was greater than or equal to the High Filter Pressure Shutdown setpoint for its time delay. The default values for these setpoints are 30 PSI and a delay of 10 minutes. If the Filter setting is "Filter minus Oil", use the absolute value of the filter differential when checking the High Oil Filter Pressure safeties.

High Oil Filter Pressure Warning - The Oil Filter Pressure was greater than or equal to the High Filter Pressure Warning setpoint for its time delay. The default values for these setpoints are 25 PSI and a delay of 15 minutes. If the Filter setting is "Filter minus Oil", use the absolute value of the filter differential when checking the High Oil Filter Pressure safeties.

High Oil Pressure (Kobe) – If the compressor type is set to Other Manufacturer (Kobe), the oil pump type is set to Demand and if Oil Pressure rises above 325 PSIA for more than 5 seconds this shutdown will occur. This shutdown is only active when the compressor is running and is also not checked for the first 90 seconds after the compressor starts.

High Oil Separator Temp Sensor Warning – This warning message is issued if the Oil Separator Temperature reading (analog board 1, channel 4) was to the upper or maximum range (out of range) for its sensor.

High Oil Temperature Sensor Fault – This shutdown message is issued if the Oil Temperature reading (analog board 1, channel 3) was to the upper or maximum range (out of range) for its sensor.

High Oil Temp Compressor Sensor Warning – This warning message is issued if the Oil Temperature reading (analog board 1, channel 3) was to the upper or maximum range (out of range) for its sensor.

High Process Entering Temp Sensor Warning – This warning message is issued if the Process Entering Temperature reading (analog board 2, channel 4) was to the upper or maximum range (out of range) for its sensor.

High Process Entering Temp Shutdown - The Entering Process Temperature was greater than or equal to the High Entering Process Temperature Shutdown setpoint for its time delay.

High Process Entering Temp Warning - The Entering Process Temperature was greater than or equal to the High Entering Process Temperature Warning setpoint for its time delay.

High Process Leaving Temp Sensor Warning – This warning message is issued if the Process Leaving Temperature reading (analog board 1, channel 5) was to the upper or maximum range (out of range) for its sensor.

High Process Leaving Temp Shutdown - The Leaving Process Temperature was greater than or equal to the High Leaving Process Temperature Shutdown setpoint for its time delay.

High Process Leaving Temp Warning - The Leaving Process Temperature was greater than or equal to the High Leaving Process Temperature Warning setpoint for its time delay.

High Rem Capacity Position Sensor Warning – This warning message is issued if the Remote Capacity Position reading was to the upper or maximum range (out of range) for its sensor.

High Remote Control Setpoint Sensor Warning – This warning message is issued if the Remote Control Setpoint sensor reading was to the lower or minimum range (out of range) for its sensor.

High RPM Sensor Warning - This warning message is issued if the RPM reading was to the higher or maximum range (out of range) for its sensor.

High RPM Shutdown - This shutdown applies if Engine or Turbine Drive was enabled. If the RPM's of the motor exceeds this setpoint, a shutdown will occur.

High RPM Warning - This warning applies if Engine or Turbine Drive was enabled. If the RPM's of the motor exceeds this setpoint, a warning will occur.

High Separator Temperature Sensor Fault – This shutdown message is issued if the Separator Temperature reading was to the upper or maximum range (out of range) for its sensor.

High Suction Pressure Shutdown - The Suction Pressure was greater than or equal to the active High Suction Pressure Shutdown setpoint for its time delay.

High Suction Pressure Warning - The Suction Pressure was greater than or equal to the active High Suction Pressure Warning setpoint for its time delay.

High Suction Temp Sensor Warning – This warning message is issued if the Suction Temperature reading (analog board 1, channel 1) was to the upper or maximum range (out of range) for its sensor.

High System Disch Pressure Sensor Warning – This warning message is issued if the System Discharge reading (analog board 1, channel 11) was to the upper or maximum range (out of range) for its sensor.

High Vyper Coolant Temperature Sensor Warning - This warning message is issued if the Vyper Coolant Temperature reading was to the higher or maximum range (out of range) for its sensor.

High Vyper Coolant Temperature Shutdown - This shutdown is issued if the Vyper Coolant Temperature reading was greater than or equal to the Vyper Coolant Temperature Shutdown setpoint for its time delay.

High Vyper Coolant Temperature Warning - This warning is issued if the Vyper Coolant Temperature reading was greater than or equal to the Vyper Coolant Temperature Warning setpoint for its time delay.

Insufficient Main Oil Pressure Shutdown - The Slide Valve is greater than 50% and the Oil Pressure (PSIA) is less than or equal to the Suction Pressure (PSIA) multiplied by 1.5 and then added to 15.0.

Liquid Injection Closed Warning - This warning will be triggered when this output is overridden and set to 0%.

Liquid Slugging Shutdown - This shutdown is triggered off of a sudden decrease in Discharge Temperature that is greater than the Liquid Slugging Shutdown setpoint for a five (5) second period. That is, if the Discharge Temperature is 130 degrees F, and the Liquid Slug Shutdown setpoint is 20 degrees F, then a sudden drop in Discharge Temperature from 130 to 110 degrees F within a five second period will generate a shutdown condition.

Liquid Slugging Warning - This warning is triggered off of a sudden decrease in Discharge Temperature that is greater than the Liquid Slug Warning setpoint for a five (5) second period. That is, if the Discharge Temperature is 130 degrees F, and the Liquid Slugging Warning setpoint is 10 degrees F, then a sudden drop in Discharge Temperature from 130 to 120 degrees F within a five second period will generate a warning condition.

Low Auxiliary Analog 1-20 Shutdown - The Auxiliary Analog #1-20 value was less than or equal to the low Auxiliary Analog #1-20 shutdown setpoint for its time delay.

Low Auxiliary Analog 1-20 Warning - The Auxiliary Analog #1-20 value was less than or equal to the low Auxiliary Analog #1-20 warning setpoint for its time delay.

Low Auxiliary Analog Input 1-20 Sensor Warning - This warning message is issued if the sensor connected to the associated Auxiliary Analog Input channel was below the Low End range for its sensor. This is strictly a warning, as the compressor does not stop. This warning is logged into the Event Log.

Low Bal Piston Pressure Sensor Warning - This warning message is issued if the Balance Piston Pressure reading (analog board 1, channel 10) was to the lower or minimum range (out of range) for its sensor.

Low Comp. Oil Pressure Sensor Fault - This shutdown message is issued if the Oil Pressure reading was to the lower or minimum range (out of range) for its sensor.

Low Comp. Oil Pressure Shutdown - If the type of compressor is a Reciprocating type, then a shutdown will occur if the Oil Pressure minus the Suction Pressure is less than the Low Comp. Oil Pressure Shutdown setpoint for the period of the delay. If the compressor type is set for anything other than Reciprocating, then the shutdown is based upon the following oil pump configurations:

- **No Pump** – A shutdown will occur if the Discharge Pressure minus the Oil Pressure is greater than the Low Compressor Oil Pressure Shutdown Setpoint for the period of the delay.
- **Full Time** - A shutdown will occur if the Oil Pressure minus the Discharge Pressure is less than the Low Compressor Oil Pressure Shutdown Setpoint for the period of the delay.
- **Demand** - A shutdown will occur if the Discharge Pressure minus the Oil Pressure is greater than the Low Compressor Oil Pressure Shutdown Setpoint for the period of the delay.
- **Shaft pump or Shaft Aux. Pump** - A shutdown will occur if the Oil Pressure minus the Discharge Pressure is less than the Low Compressor Oil Pressure Shutdown Setpoint for the period of the delay.

Low Comp. Oil Pressure Warning - If the type of compressor is a Reciprocating type, then a warning will occur if the Oil Pressure minus the Suction Pressure is less than the Low Comp. Oil Pressure Warning setpoint for the period of the delay. If the compressor type is set for anything other than Reciprocating, then the warning is based upon the following oil pump configurations:

- **No Pump** – A warning will occur if the Discharge Pressure minus the Oil Pressure is greater than the Low Compressor Oil Pressure Warning Setpoint for the period of the delay.
- **Full Time** - A warning will occur if the Oil Pressure minus the Discharge Pressure is less than the Low Compressor Oil Pressure Warning Setpoint for the period of the delay.
- **Demand** - A warning will occur if the Discharge Pressure minus the Oil Pressure is greater than the Low Compressor Oil Pressure Warning Setpoint for the period of the delay.
- **Shaft pump or Shaft Aux. Pump** - A warning will occur if the Oil Pressure minus the Discharge Pressure is less than the Low Compressor Oil Pressure Warning Setpoint for the period of the delay.

Low Comp. Oil Temperature Sensor Fault - This shutdown message is issued if the Oil Temperature reading was to the lower or minimum range (out of range) for its sensor.

Low Comp. Oil Temperature Shutdown - The Oil Temperature was less than or equal to the Low Oil Temperature Shutdown setpoint for its time delay.



Low Comp. Oil Temperature Warning - The Oil Temperature was less than or equal to the Low Oil Temperature Warning setpoint for its time delay.

Low Demand Pump Pressure Warning - This warning will be generated if the selected pump type is Demand, the compressor is running, the pump is running, and the oil pressure is less than 5 PSI above the discharge pressure for 30 seconds.

Low Demand Pump Pressure Shutdown - This shutdown is generated if the selected pump type is Demand, the compressor is running, the pump is running, and the oil pressure is less than 2 PSI above the discharge pressure for 120 seconds.

Low Discharge Pressure Shutdown – The Discharge Pressure was less than or equal to the Low Discharge Pressure Shutdown setpoint for its time delay. This setpoint is checked when enabled, when the compressor is running, and when a programmable compressor start delay has timed out

Low Discharge Pressure Sensor Fault - This shutdown message is issued if the Discharge Pressure reading was to the lower or minimum range (out of range) for its sensor.

Low Discharge Temperature Sensor Fault - This shutdown message is issued if the Discharge Temperature reading was to the lower or minimum range (out of range) out of range for its sensor.

Low Disch Temp Sensor Warning - This warning message is issued if the Discharge Temperature reading (analog board 1, channel 2) was to the lower or minimum range (out of range) for its sensor.

Low Economizer Pressure Sensor Warning - This warning message is issued if the Economizer Pressure reading (analog board 2, channel 14) was to the lower or minimum range (out of range) for its sensor.

Low EZ cool LIOC Feedback Sensor Warning - This warning message is issued if the EZ Cool LIOC sensor reading was to the lower or minimum range (out of range) for its sensor.

Low Filter Pressure Sensor Warning - This warning message is issued if the Filter Pressure reading (analog board 1, channel 7) was to the lower or minimum range (out of range) for its sensor.

Low Kw Monitoring Sensor Warning - This warning message is issued if the Kilowatt Monitoring reading (analog board 2, channel 16) was to the lower or minimum range (out of range) for its sensor.

Low Liquid Level Sensor Warning - This warning message is issued if the Liquid Level reading was to the lower or minimum range (out of range) for its sensor.

Low Main Oil Inj Pressure Sensor Warning - This warning message is issued if the Main Oil Injection Pressure reading was to the lower or minimum range (out of range) for its sensor.

Low Main Oil Injection Pressure Shutdown - This shutdown can occur if Oil Injection was enabled. The Oil Injection Pressure (channel 15, Analog Board 2) must be greater than or equal to the Suction Pressure times 1.5, plus the setpoint to be in the safe condition, otherwise this shutdown will occur. Used only on vertical oil separator with liquid injection oil cooled packages.

Low Manifold Pressure Sensor Warning - This warning message is issued if the Manifold Pressure reading was to the lower or minimum range (out of range) for its sensor.

Low Motor Current Sensor Warning - This warning message is issued if the Motor Current reading (analog board 1, channel 16) was to the lower or minimum range (out of range) for its sensor.

Low Motor Current Shutdown - This shutdown message is issued if, while the compressor was running, the Motor Amps reading was less than or equal to the Low Motor Amps Shutdown setpoint.

Low Oil Differential 1 (Kobe) – If the compressor type is set to Other Manufacturer (Kobe), the oil pump type is set to Demand and if the differential between Oil Pressure and Suction Pressure is less than 50 PSI for 5 seconds this shutdown will occur. This shutdown is only active when the compressor is running and is also not checked for the first 90 seconds after the compressor starts.

Low Oil Differential 2 (Kobe) – If the compressor type is set to Other Manufacturer (Kobe), the oil pump type is set to Demand and the differential between Oil Pressure and Suction Pressure is less than Suction Pressure times 0.8 for 5 seconds this shutdown will occur. This shutdown is only active when the compressor is running and is also not checked for the first 90 seconds after the compressor starts.

Low Oil Separator Temp Sensor Warning - This warning message is issued if the Oil Separator Temperature reading (analog board 1, channel 4) was to the lower or minimum range (out of range) for its sensor.

Low Oil Temp Compressor Sensor Warning - This warning message is issued if the Oil Temperature reading (analog board 1, channel 3) was to the lower or minimum range (out of range) for its sensor.

Low Process Entering Temp Sensor Warning - This warning message is issued if the Process Entering Temperature reading (analog board 2, channel 4) was to the lower or minimum range (out of range) for its sensor.

Low Process Entering Temp Shutdown - The Entering Process Temperature was less than or equal to the Low Entering Process Temperature Shutdown setpoint for its time delay.

Low Process Entering Temp Warning - The Entering Process Temperature was less than or equal to the Low Entering Process Temperature Warning setpoint for its time delay.

Low Process Leaving Temp Sensor Warning - This warning message is issued if the Process Leaving Temperature reading (analog board 1, channel 5) was to the lower or minimum range (out of range) for its sensor.

Low Process Leaving Temp Shutdown - The Leaving Process Temperature was less than or equal to the Low Leaving Process Temperature Shutdown setpoint for its time delay.

Low Process Leaving Temp Warning - The Leaving Process Temperature was less than or equal to the Low Leaving Process Temperature Warning setpoint for its time delay.

Low Rem Capacity Position Sensor Warning - This warning message is issued if the Remote Capacity Position reading was to the lower or minimum range (out of range) for its sensor.

Low Remote Control Setpoint Sensor Warning – This warning message is issued if the Remote Control Setpoint sensor reading was to the lower or minimum range (out of range) for its sensor.

Low RPM Sensor Warning - This warning message is issued if the RPM reading was to the lower or minimum range (out of range) for its sensor.

Low RPM Shutdown - This shutdown applies if Engine or Turbine Drive was enabled. If the RPM's of the motor drops below this setpoint, a shutdown will occur.

Low RPM Warning - This warning applies if Engine or Turbine Drive was enabled. If the RPM's of the motor drops below this setpoint, a warning will occur.

Low Separator Temperature Sensor Fault - This shutdown message is issued if the Separator Temperature reading was to the lower or minimum range (out of range) for its sensor.

Low Separator Temperature Shutdown - The Oil Separator Temperature was less than or equal to the Low Oil Separator Temperature Shutdown setpoint for its time delay.

Low Separator Temperature Warning - The Oil Separator Temperature was less than or equal to the Low Oil Separator Temperature Warning setpoint for its time delay.

Low Slide Stop Sensor Warning - This warning message is issued if the Slide Stop sensor reading was to the lower or minimum range (out of range) for its sensor.

Low Slide Valve Sensor Warning - This warning message is issued if the Slide Valve sensor reading was to the lower or minimum range (out of range) for its sensor.

Low Suction Pressure Sensor Fault - This shutdown message is issued if the Suction Pressure reading was to the lower or minimum range (out of range) for its sensor.

Low Suction Shutdown -- Mode 1 - When running in Mode 1, if the Suction Pressure was less than or equal to the active Mode 1 Low Suction Shutdown setpoint for its time delay.

Low Suction Shutdown -- Mode 2 - When running in Mode 2, if the Suction Pressure was less than or equal to the active Mode 2 Low Suction Shutdown setpoint for its time delay.

Low Suction Shutdown -- Mode 3 - When running in Mode 3, if the Suction Pressure was less than or equal to the active Mode 3 Low Suction Shutdown setpoint for its time delay.

Low Suction Shutdown -- Mode 4 - When running in Mode 4, if the Suction Pressure was less than or equal to the active Mode 4 Low Suction Shutdown setpoint for its time delay.

Low Suction Pressure Sensor Warning - This warning message is issued if the Suction Pressure reading (analog board 1, channel 1) was to the lower or minimum range (out of range) for its sensor.

Low Suction Warning -- Mode 1 - When running in Mode 1, if the Suction Pressure was less than or equal to the active Mode 1 Low Suction Warning setpoint for its time delay.

Low Suction Warning -- Mode 2 - When running in Mode 2, if the Suction Pressure was less than or equal to the active Mode 2 Low Suction Warning setpoint for its time delay.

Low Suction Warning -- Mode 3 - When running in Mode 3, if the Suction Pressure was less than or equal to the active Mode 3 Low Suction Warning setpoint for its time delay.

Low Suction Warning -- Mode 4 - When running in Mode 4, if the Suction Pressure was less than or equal to the active Mode 4 Low Suction Warning setpoint for its time delay.

Low System Disch Pressure Sensor Warning - This warning message is issued if the System Discharge Pressure reading (analog board 1, channel 11) was to the lower or minimum range (out of range) for its sensor.

Low Vyper Coolant Temperature Sensor Warning - This message is issued if the Vyper Coolant Temperature reading was to the lower or minimum range (out of range) for its sensor.

Low Vyper Coolant Temperature Shutdown - This shutdown is issued if the Vyper Coolant Temperature reading



was less than or equal to the Vyper Coolant Temperature Shutdown setpoint for its time delay.

Low Vyper Coolant Temperature Warning - This warning is issued if the Vyper Coolant Temperature reading was less than or equal to the Vyper Coolant Temperature Warning setpoint for its time delay.

Manual Stop Shutdown (RCSI only) – Issued when a manual stop of the compressor is issued.

Missing Comp. Oil Pressure Shutdown A - This shutdown will occur if the Oil Pressure (PSIA) is less than the Suction Pressure (PSIA) multiplied by 1.1 and then added to 15.0, then delayed by 2 min.

Missing Comp. Oil Pressure Shutdown B - This shutdown will occur if the Oil Pressure (PSIA) is less than the Suction Pressure (PSIA) added to 15.0, then delayed by 25 sec.

Missing Comp. Oil Pressure Shutdown C - This shutdown will occur if the compressor is running, AND the compressor type is NOT a Recip., AND the pump type is No Pump or Demand Pump, AND the Oil Pressure (PSIA) is less than the Discharge Pressure (PSIA) minus 75 (PSIA) for a delay of 25 sec.

Missing Comp. Oil Pressure Warning - The Oil Pressure (PSIA) is less than the Suction Pressure (PSIA) multiplied by 1.1 and then added to 15.0, then delayed by 25 sec.

Mode 1 Shutdown – When the selected regulation control input for Mode 1 has exceeded its shutdown setpoint for the delay period, a Shutdown occurs.

Mode 1 Warning – When the selected regulation control input for Mode 1 has exceeded its warning setpoint for the delay period, a Warning occurs.

Mode 2 Shutdown – When the selected regulation control input for Mode 2 has exceeded its shutdown setpoint for the delay period, a Shutdown occurs.

Mode 2 Warning – When the selected regulation control input for Mode 2 has exceeded its warning setpoint for the delay period, a Warning occurs.

Mode 3 Shutdown – When the selected regulation control input for Mode 3 has exceeded its shutdown setpoint for the delay period, a Shutdown occurs.

Mode 3 Warning – When the selected regulation control input for Mode 3 has exceeded its warning setpoint for the delay period, a Warning occurs.

Mode 4 Shutdown – When the selected regulation control input for Mode 4 has exceeded its shutdown setpoint for the delay period, a Shutdown occurs.

Mode 4 Warning - When the selected regulation control input for Mode 4 has exceeded its warning setpoint for the delay period, a Warning occurs.

Oil Level Shutdown - The corresponding input module for Low Oil Level (analog board 1, module 13) was de-energized for its delay period.

Oil Log Shutdown - Oil log was enabled and the Compressor has not started and the Oil Pump has already run for the fail delay time.

Oil Pump Auxiliary Failure - While starting the Oil Pump, the Oil Pump Auxiliary input module did not energize within five (5) seconds, or, while the Oil Pump was running, the Oil Pump Auxiliary input module de-energized.

Oil Pump 1 Auxiliary Warning - While starting Oil Pump #1, the Oil Pump #1 Auxiliary input module did not energize within five (5) seconds, or, while this Oil Pump was running, the Oil Pump #1 Auxiliary input module de-energized. This indicates Dual Pump Control and Pump #1 is the lead pump.

Oil Pump 1 Auxiliary Shutdown - While starting Oil Pump #1, the Oil Pump #1 Auxiliary input module did not energize within five (5) seconds, or, while this Oil Pump was running, the Oil Pump #1 Auxiliary input module de-energized. This indicates Dual Pump Control and Pump #1 is the last pump to start.

Oil Pump 2 Auxiliary Warning - While starting Oil Pump #2, the Oil Pump #2 Auxiliary input module did not energize within five (5) seconds, or, while this Oil Pump was running the Oil Pump #2 Auxiliary input module de-energized. This indicates Dual Pump Control and Pump #2 is the lead pump.

Oil Pump 2 Auxiliary Shutdown - While starting Oil Pump #2, the Oil Pump auxiliary input module did not energize within five (5) seconds, or, while the Oil Pump was running, the Oil Pump auxiliary input module de-energized. This indicates Dual Pump Control and Pump #2 is the last pump to start.

Process Stopped - See Event Log – One of the control program subroutine processes has stopped functioning and a message has been entered into the event log. This is a Warning message.

Remote Stop Shutdown (RCSI only) – Issued when a remote stop of the compressor is performed.

Restart Lockout Shutdown - If the Restart Lockout has been enabled AND power has been off for longer that the Restart Delay time, then issue this at power up of the panel.

Separator Condensing Safety - This warning will be triggered if the Discharge Temperature is less than the Saturated Discharge Temperature plus an adjustable offset for an adjustable delay period.

Separator Condensing Shutdown - If the compressor is running, AND the Discharge Temperature is less than the sum of the Saturated Discharge Temperature plus the value of the Shutdown Offset setpoint for the Delay period, a

shutdown will be issued.

Separator Condensing Warning - If the compressor is running, AND the Discharge Temperature is less than the sum of the Saturated Discharge Temperature plus the value of the Warning Offset setpoint for the Delay period, a warning will be issued.

Shunt Trip Activated Warning - This warning will be generated if either the False Running Failure shutdowns (Motor Amps or Confirmed Running) occurs, and the Shunt Trip digital output is configured (board and channel).

Start Failure Shutdown For Eng And Turb - The unit has been configured for either an Engine or a Turbine. Once the RUN signal has been initiated, if a RUN condition does not occur (RPM sensor does not sense the Confirmed Running RPM value) before the Maximum Starting Delay (5 min. default) expires, this message will be issued.

Start Failure Shutdown For Eng And Turb - This message may be issued if Engine or Turbine was enabled, and the start delay period to get to a running condition has expired.

Starting Failure - Low Motor Amps - This shutdown message is displayed if after 45 seconds from sending the compressor start signal, the Motor Amps reading is not greater than the Low Motor Amps Shutdown setpoint.

Starting Failure - No Compressor Auxiliary - This shutdown message is displayed if after 45 seconds from sending the compressor start command, the compressor auxiliary input module is still not energized.

VSD – Ambient Temperature Force Unload - Occurs when the Vyper cabinet temperature reaches 135 F and this will unload the Slide Valve.

VSD – Ambient Temperature Inhibit - Occurs when the Vyper cabinet temperature reaches 130 F and this will inhibit the Slide Valve from loading.

VSD Communication Failure Warning - If Vyper™ option is enabled and communications has been lost between the Quantum™ HD and the VSD driver for over five seconds, this warning is shown.

VSD Board NovRAM Failure – The integrity of the NovRAM is verified on every power-up. A known value is written to a specified location in NovRAM, read back from that location, and compared to the value originally written. If the two values do not match, the NovRAM Failure fault is displayed.

VSD Board Motor Current > 15% - This fault occurs whenever the Vyper™ is running and a motor current of less than 10 % FLA is detected for at least twenty-five continuous seconds. This fault is only checked when the Run Acknowledge output is engaged. Therefore, it is NOT checked during STANDBY, which prevents this fault from occurring during STANDBY.

VSD Board Power Supply Fault – The various DC power supplies which power the Board are monitored via hardware located on the Board. If any of these power supplies fall outside their allowable limits, the unit will trip and the Quantum™ HD Panel will display the fault message.

VSD Board Run Signal Fault - This fault occurs if the Run Signal from the Quantum Control Panel is high, but the speed command being sent over the RS-485 communications link is zero. It may also occur if the Run Signal is low, but the speed command is not zero. Both conditions must be present for five seconds before the fault is set, and are only applicable in automatic mode.
VSD Board to Panel Comms Loss - This fault occurs when the Frick Interface Board loses communications from the Quantum™ HD Control Panel, meaning it has not received any data for a period of fifteen seconds. It is only applicable in automatic mode.

VSD Current Imbalance Fault – When the average of the three output phase currents exceeds 80% of the 100% Job FLA, the % Output Current Imbalance is calculated using the following equation: [(Ia-Iave) + (Ib-Iave) + (Ic-Iave) / {2}{Iave}] [100]: Iave = {Ia + Ib + Ic}/3. If the % Imbalance exceeds 30% continuously for 45 seconds the unit shall trip and the Quantum™ HD panel shall display this message. The imbalance fault is disabled when the average of the three output phase currents drops below 80% FLA.

VSD DC Bus Voltage Imbalance Fault – The 1/2 DC link voltage magnitude must remain within ± 88 VDC of the total DC link voltage divided by two for both 60 and 50 Hz VSD's. If the 1/2 DC link magnitude exceeds the ± 88 volt window, the unit will trip and the Quantum™ HD will display this message.

VSD High Converter Heatsink Temp Fault – A thermistor sensor is located behind the last SCR/Diode block on the copper chill plate of the Vyper™ Power Unit. If this thermistor detects a temperature of 170°F (76°C) or higher, a shutdown will occur. The cooling fans and coolant pump on the Vyper™ will continue to run after the shutdown, until the thermistor temperature has dropped to below 160°F (71°C). This shutdown requires a manual reset via the Reset push button on the Vyper™ Logic board.

VSD High DC Bus Voltage Fault – The DC link overvoltage trip level is determined by hardware on the logic board and it is designed to trip the unit at 745 +/- 17 VDC for both 60 and 50 Hz VSD's. If the DC bus current exceeds this level, the unit will trip and the Quantum™ HD Panel will display this message.

VSD High Internal Ambient Temp Fault – The logic board contains a temperature sensor which monitors the unit's internal ambient temperature. The magnitude of the unit's internal temperature is compared to a limit of 145°F. If this limit is exceeded the unit will trip and the Quantum™ HD panel will display this message. The fan(s) and water pump remain energized until the internal temperature drops below 137°F. The fan(s) and water pump will be de-energized when the internal temperature drops



below 137°F.

VSD High Inverter Baseplate Temp Fault – A thermistor sensor is located inside the IGBT Module on the Vyper™ power unit. If this thermistor detects a temperature of 175°F (79°C) or higher, a shutdown will occur. The cooling fans and coolant pump on the Vyper™ will continue to run after the shutdown, until the thermistor temperature has dropped to below 165°F (74°C). This shutdown requires a manual reset via the Reset push button on the Vyper ™ logic board.

VSD High Phase A Instantaneous Current – Phase A of the output line to the motor is monitored via a current transformer within the drive. The unit's Phase A of instantaneous output current is compared to a prescribed limit which is contained in the hardware. If the peak current limit is exceeded, the unit will trip and the Quantum™ HD Panel will display this message.

VSD High Phase B Instantaneous Current – Phase B of the output line to the motor is monitored via a current transformer within the drive. The unit's Phase B of instantaneous output current is compared to a prescribed limit which is contained in the hardware. If the peak current limit is exceeded, the unit will trip and the Quantum™ HD Panel will display this message.

VSD High Phase C Instantaneous Current – Phase C of the output line to the motor is monitored via a current transformer within the drive. The unit's Phase C of instantaneous output current is compared to a prescribed limit which is contained in the hardware. If the peak current limit is exceeded, the unit will trip and the Quantum™ HD Panel will display this message.

VSD High Phase A Inverter Baseplate Temp – A thermistor sensor is located inside the IGBT Module on the Vyper™ power unit. If this thermistor detects a temperature of 175°F (79°C) or higher of the Phase A Inverter, a shutdown will occur. The cooling fans and coolant pump on the Vyper™ will continue to run after the shutdown, until the thermistor temperature has dropped to below 165°F (74°C). This shutdown requires a manual reset via the Reset push button on the Vyper™ logic board.

VSD High Phase B Inverter Baseplate Temp – A thermistor sensor is located inside the IGBT Module on the Vyper™ power unit. If this thermistor detects a temperature of 175°F (79°C) or higher of the Phase B Inverter, a shutdown will occur. The cooling fans and coolant pump on the Vyper™ will continue to run after the shutdown, until the thermistor temperature has dropped to below 165°F (74°C). This shutdown requires a manual reset via the Reset push button on the Vyper™ logic board.

VDS High Phase C Inverter Baseplate Temp – A thermistor sensor is located inside the IGBT Module on the Vyper™ power unit. If this thermistor detects a temperature of 175°F (79°C) or higher of the Phase C Inverter, a shutdown will occur. The cooling fans and coolant pump on the Vyper™ will continue to run after the shutdown, until the thermistor temperature has dropped to below 165°F (74°C). This shutdown requires a manual reset via the Reset push button on the Vyper™ logic board.

VSD Initialization Fault - At power-up, all the boards go through a process called initialization. At this time, memory locations are cleared, jumper positions are checked, and serial communications links are established.

VSD Invalid Current Scale Selection – The J1 connector on the Vyper™ Logic board contains jumpers along with wires from the output CTs. Since the part number of the Logic board is the same on all horsepower sizes, the jumpers tell the logic board the size of the Vyper™ being employed in order to properly scale the output current. If the jumper configuration is found by the Logic board to be invalid, the system will be shut down and the above message will be generated.

VSD Logic Board Power Supply Fault – The various DC power supplies which power the Logic Board are monitored via hardware located on the Logic Board. If any of these power supplies fall outside their allowable limits, the unit will trip and the Quantum™ HD Panel will display the fault message.

VSD Logic Board Processor Fault – This shutdown is generated if a communications problem occurs between the two microprocessors on the Vyper™ Logic Board. If this shutdown occurs, replace the Vyper™ Logic board.

VSD Low Converter Heatsink Temp Fault – The phase bank assembly heatsink temperature and the inverter module base plate temperature are compared to a lower limit of 37°F. If the inverter base plate temperature or the converter heat sink temperature falls below 37°F, this message will be displayed. In addition, if both temperatures fall below the 37°F limit, the unit will trip and the fan(s) and water pump will be energized.

VSD Low DC Bus Voltage Fault – The DC link under voltage trip level must be set at 500 VDC for 60 Hz and 414 VDC for 50 Hz VSD's. If the DC link drops below this level, the unit will trip, and the Vyper™ Logic Board will initiate a system shutdown.

VSD Low Inverter Baseplate Temp Fault – The phase bank assembly heatsink temperature and the inverter module base plate temperature are compared to a lower limit of 37°F. If the inverter module base plate temperature falls below this limit the unit will trip and the Quantum™ HD Panel will display this message.

VSD Low Phase A Inverter Baseplate Temp. – The phase A heatsink temperature and the inverter module base plate temperature are compared to a lower limit of 37°F. If the inverter module base plate temperature falls below this limit the unit will trip and the Quantum™ HD Panel will display this message. In addition, if both the inverter and converter temperatures fall below the 37°F limit, the unit will trip and the fan(s) and water pump will be energized.

VSD Low Phase B Inverter Baseplate Temp. – The phase B heatsink temperature and the inverter module base

plate temperature are compared to a lower limit of 37°F. If the inverter module base plate temperature falls below this limit the unit will trip and the Quantum™ HD Panel will display this message. In addition, if both the inverter and converter temperatures fall below the 37°F limit, the unit will trip and the fan(s) and water pump will be energized.

VSD Low Phase C Inverter Baseplate Temp. – The phase C heatsink temperature and the inverter module base plate temperature are compared to a lower limit of 37°F. If the inverter module base plate temperature falls below this limit the unit will trip and the Quantum™ HD Panel will display this message. In addition, if both the inverter and converter temperatures fall below the 37°F limit, the unit will trip and the fan(s) and water pump will be energized.

VSD Phase A Gate Driver Fault – The unit's phase bank assembly shall contain one IGBT gate driver control board. This board monitors the saturation voltage drop across the Phase A Gate Driver while gated on. If the IGBT's Phase A Gate Driver saturation voltage exceeds the prescribed limit, the gate driver will make the determination that a short circuit is present. This in turn shall cause the unit to trip and the Quantum™ HD Panel shall display this message. If the driver board's power supply voltage falls below the permissible limit, this same message shall be generated.

VSD Phase B Gate Driver Fault – The unit's phase bank assembly shall contain one IGBT gate driver control board. This board monitors the saturation voltage drop across the Phase B Gate Driver while gated on. If the IGBT's Phase B Gate Driver saturation voltage exceeds the prescribed limit, the gate driver will make the determination that a short circuit is present. This in turn shall cause the unit to trip and the Quantum™ HD Panel shall display this message. If the driver board's power supply voltage falls below the permissible limit, this same message shall be generated.

VSD Phase C Gate Driver Fault – The unit's phase bank assembly shall contain one IGBT gate driver control board. This board monitors the saturation voltage drop across the Phase C Gate Driver while gated on. If the IGBT's Phase C Gate Driver saturation voltage exceeds the prescribed limit, the gate driver will make the determination that a short circuit is present. This in turn shall cause the unit to trip and the Quantum™ HD Panel shall display this message. If the driver board's power supply voltage falls below the permissible limit, this same message shall be generated.

VSD Precharge Lockout Fault – If the Vyper™ fails to meet the precharge criteria, then the precharge circuit will wait for a period of 10 seconds. During this time, the unit's cooling fans and coolant pump remain energized in order to cool the input SCR's. Following this 10-second cooldown period, precharge will again be initiated. The unit will attempt to meet the precharge criteria three consecutive times. If the Vyper™ fails to meet the precharge criteria on three consecutive tries, the Vyper™ will shut down, lock out, and display this message. In order to initiate precharge again, the Quantum™ HD panel's compressor switch must first be placed into the STOP/RESET position.

VSD Precharge - DC Bus Voltage Imbalance – The 1/2 DC link voltage magnitude will remain within ± 88VDC of the total DC link voltage divided by two during the precharge interval for both the 60 and 50 Hz VSD's. If not, the Quantum™ HD panel will display this message. The definition for this fault is identical to "VSD - DC Bus Voltage Imbalance", except that the fault has occurred during the precharge period which begins during prelube.

VSD Precharge - Low DC Bus Voltage 1 – The DC link voltage will reach at least 50 VDC within 100 msec after the precharge relay has been pulled in on the 60 Hz 519 filter and at least 41 VDC within 100 msec on the 50 Hz 519 filter. If not, the Quantum™ HD panel will display this message.

VSD Precharge - Low DC Bus Voltage 2 – The DC link voltage will reach at least 50 VDC within 100 msec after the precharge relay has been pulled in on the 60 Hz 519 filter and at least 41 VDC within 100 msec on the 50 Hz 519 filter. If not, the Quantum™ HD panel will display this message.

VSD Run Signal Fault – Upon receipt of either of the two run commands, a 5-second timer will start. If the missing run signal is not asserted within the 5-second window, the unit will trip and the Quantum™ HD panel will display this message.

VSD Serial Communication Fault – When requesting Status data, the response data from the Vyper™ includes a bit that indicates whether communications were lost from the Frick Interface Board to the Vyper™. If this bit is high for 22 consecutive seconds, this fault occurs. This fault also occurs whenever a receive timeout, or checksum fault is detected on the Vyper™ communications, for twenty continuous seconds. While this fault is active, the Frick Interface Board will send Initialize data requests in order to reestablish the communications link. All serial input data is also cleared.

VSD Single Phase Input Power Fault – The Vyper's™ SCR Trigger Control board contains circuitry that checks the three-phase mains for the presence of all three line voltages. If all line voltages are not present, the unit will trip and the Quantum™ HD Panel will display this message.

VSD Stop Contacts Fault - This fault occurs if the No Fault signal from the Vyper™ is low. It indicates a fault is present at the Vyper™ or the Harmonic Filter, but the communications data contains no Vyper™ fault data for twenty seconds. The Frick Interface Board will send Initialize data requests while this fault is active.

VSD 105% Motor Current Overload Fault – The Vyper™ Logic Board generates this shutdown by reading the current from the 3 output current transformers. The shutdown is generated when the Vyper™ Logic board has detected that the highest of the three output phase currents has exceeded 105% of the programmed 100% full



load amps (FLA) value for more than 40 seconds. If this is detected, the unit will trip and the Quantum™ HD panel will display the fault message.

Vyper™ Coolant Low Temperature Warning - The temperature reading for the Vyper Coolant temperature was less than or equal to this setpoint for its time delay.

Vyper™ Coolant Low Temperature Shutdown - The temperature reading for the Vyper Coolant temperature was less than or equal to this setpoint for its time delay.

Vype™r Coolant High Temperature Warning - The temperature reading for the Vyper Coolant temperature was greater than or equal to this setpoint for its time delay.

Vyper™ Coolant High Temperature Shutdown - The temperature reading for the Vyper Coolant temperature was greater than or equal to this setpoint for its time delay.

Vyper™ Fault Limit Reached Shutdown - The Vyper™ Logic Board generates faults as they occur. If these faults are not of a potentially destructive nature, they are automatically cleared by the Vyper™ logic if the symptom that created the fault corrects itself. The Quantum™ control tracks these self-clearing faults, and if a total of five faults occur within a one hour period of time, a compressor shutdown will occur.

NOTES:

SECTION 6

APPENDIX

OIL SAFETY LOGIC

Part 1: Missing Oil Pressure

No Pump or Demand Pump

(All pressure calculations are in PSIA)

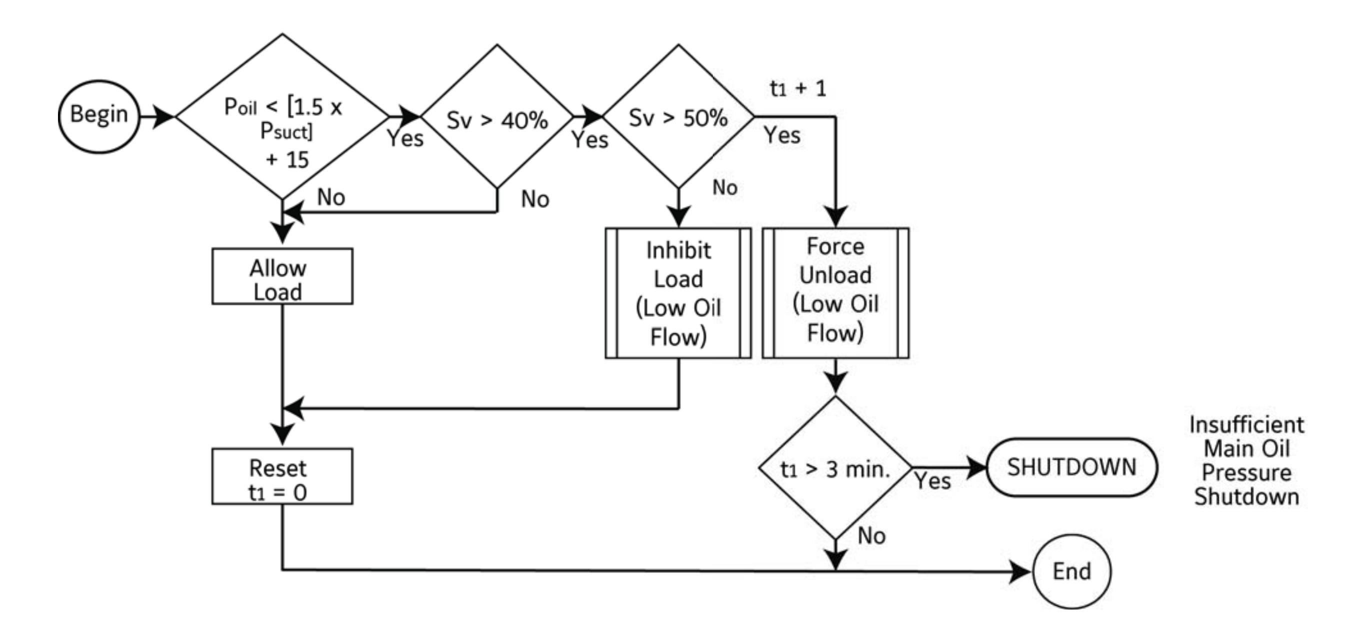


OIL SAFETY LOGIC

Part 2: Insufficient Main Oil Pressure During Low Differential

No Pump or Demand Pump

(All pressure calculations are in PSIA)

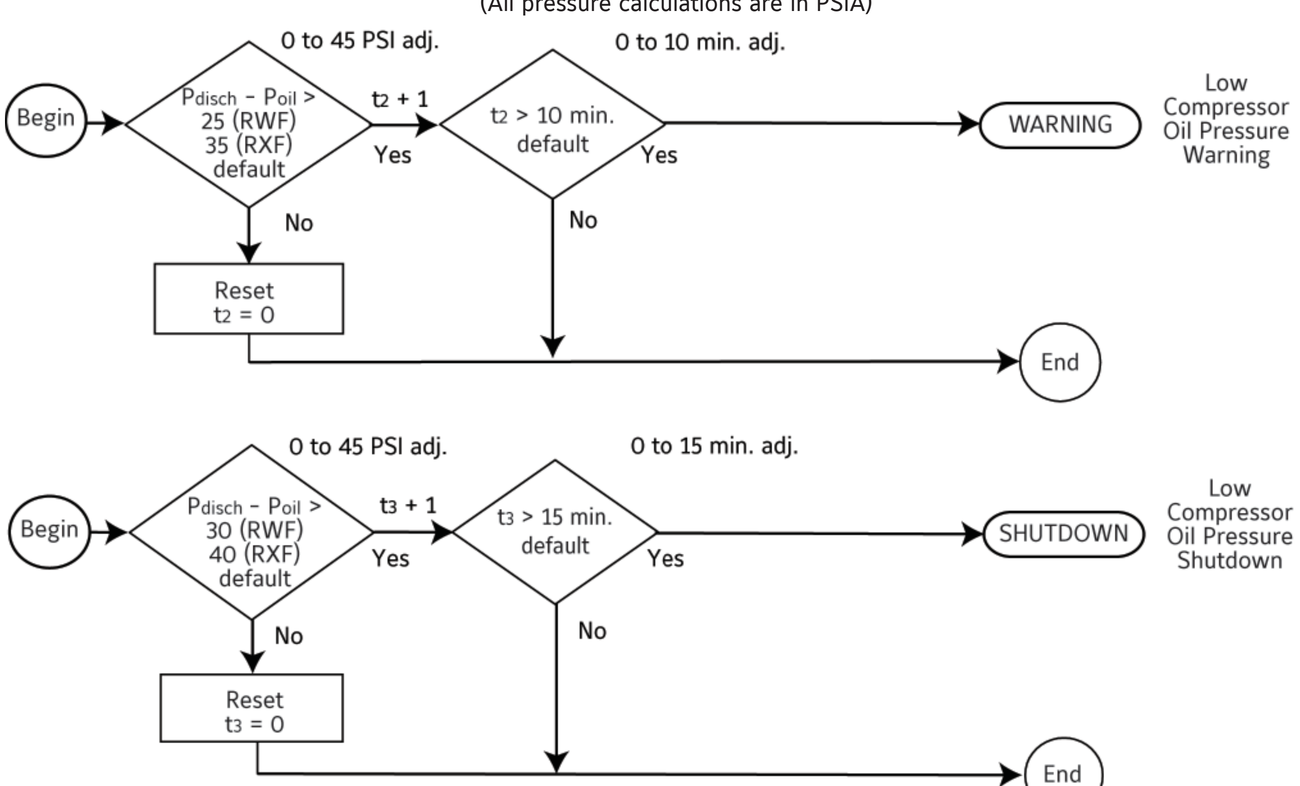


OIL SAFETY LOGIC

Part 3: Oil Circuit Pressure Drop

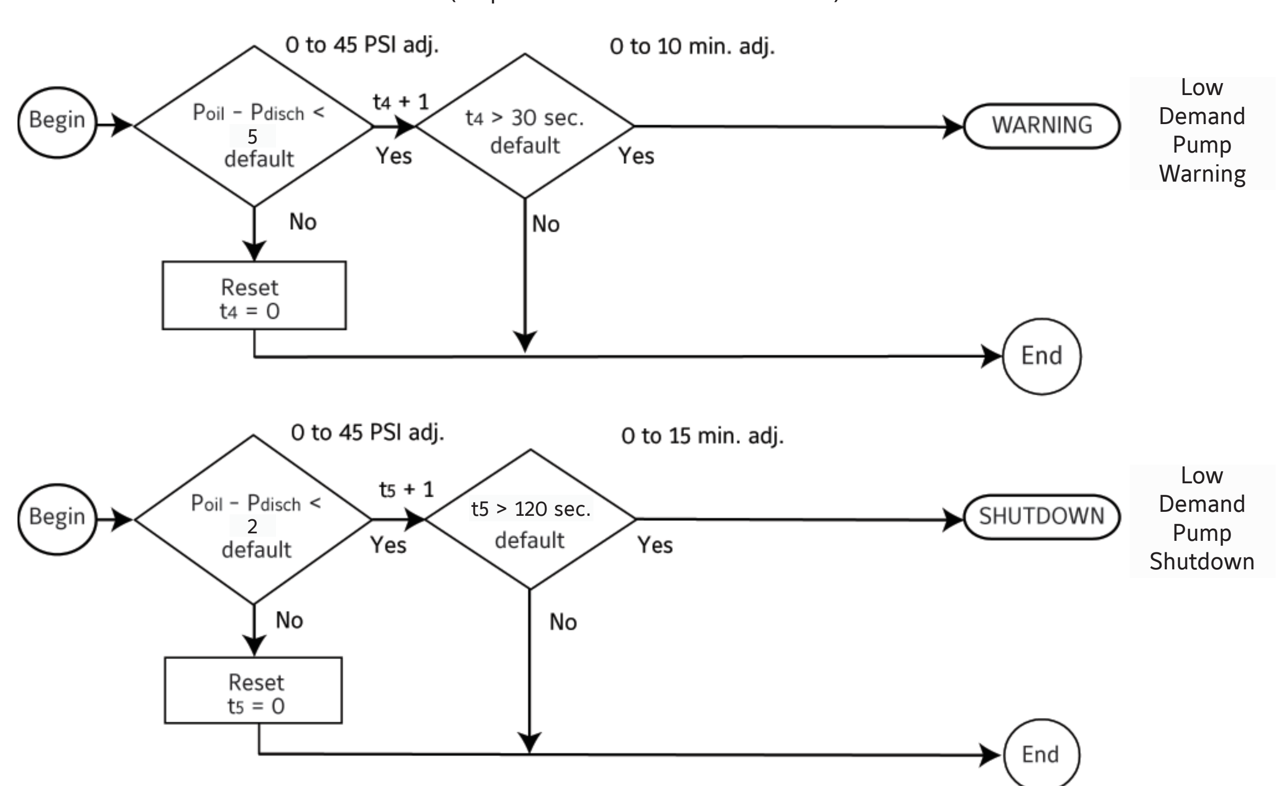
No Pump or Demand Pump

(All pressure calculations are in PSIA)



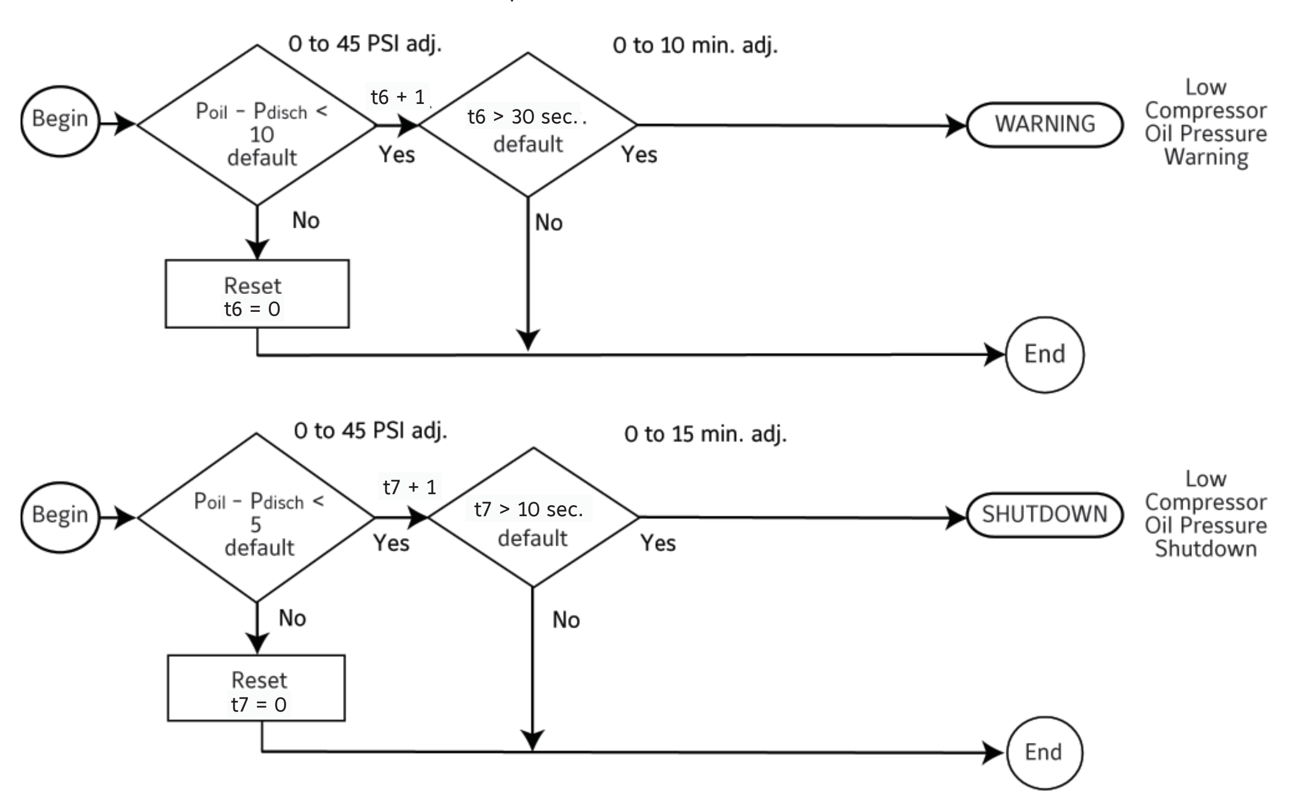
Demand Pump (With Pump On)

(All pressure calculations are in PSIA)





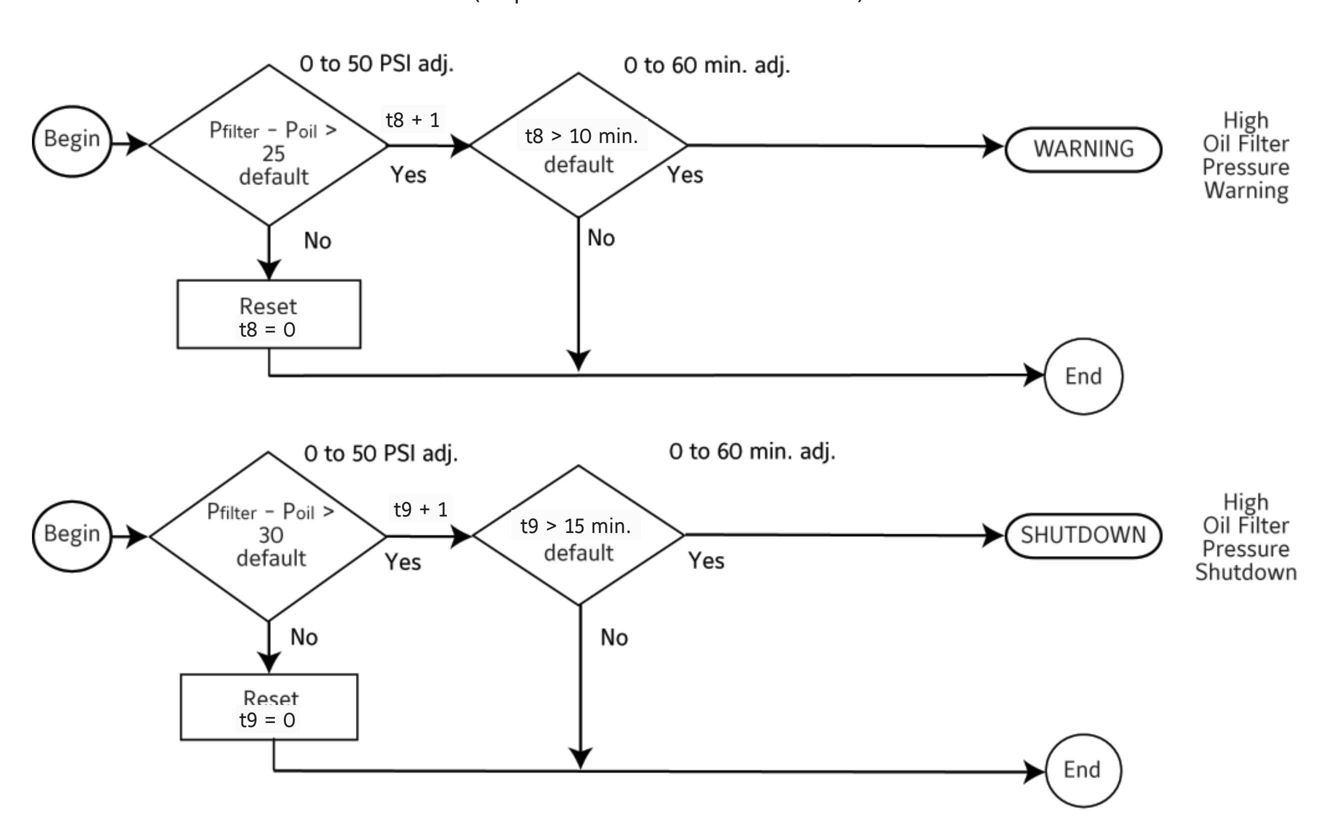
Full Time Pump (Frick Compressor Only)
(All pressure calculations are in PSIA)



OIL SAFETY LOGIC

Part 4: Oil Pressure Filter Drop

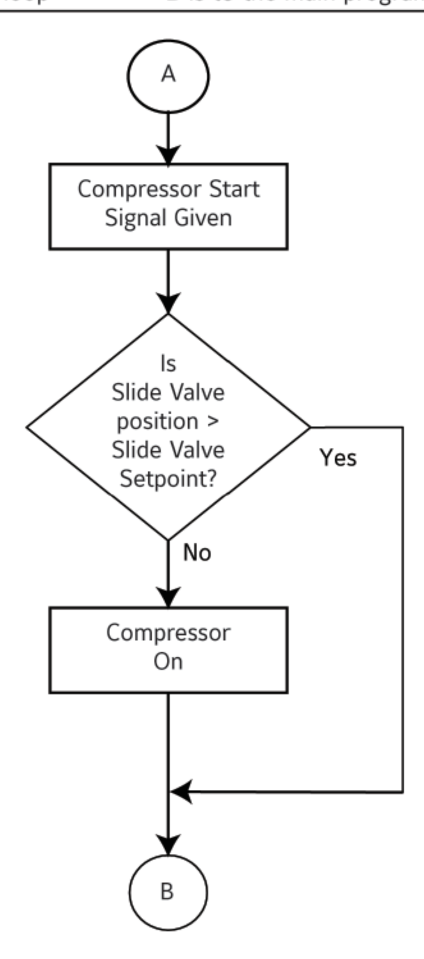
Filter Selection: Filter – Oil
(All pressure calculations are in PSIA)



Note: Only when filter pressure transducer is available

OIL PUMP STARTING LOGIC
No Pump

Differential Pressure	=	Discharge - Oil
Slide Valve Setpoint	=	Highest Allowable Slide Valve position to start (10% default).
Pump Status		Pump is Off
A is from the main program loop		***B*** is to the main program loop

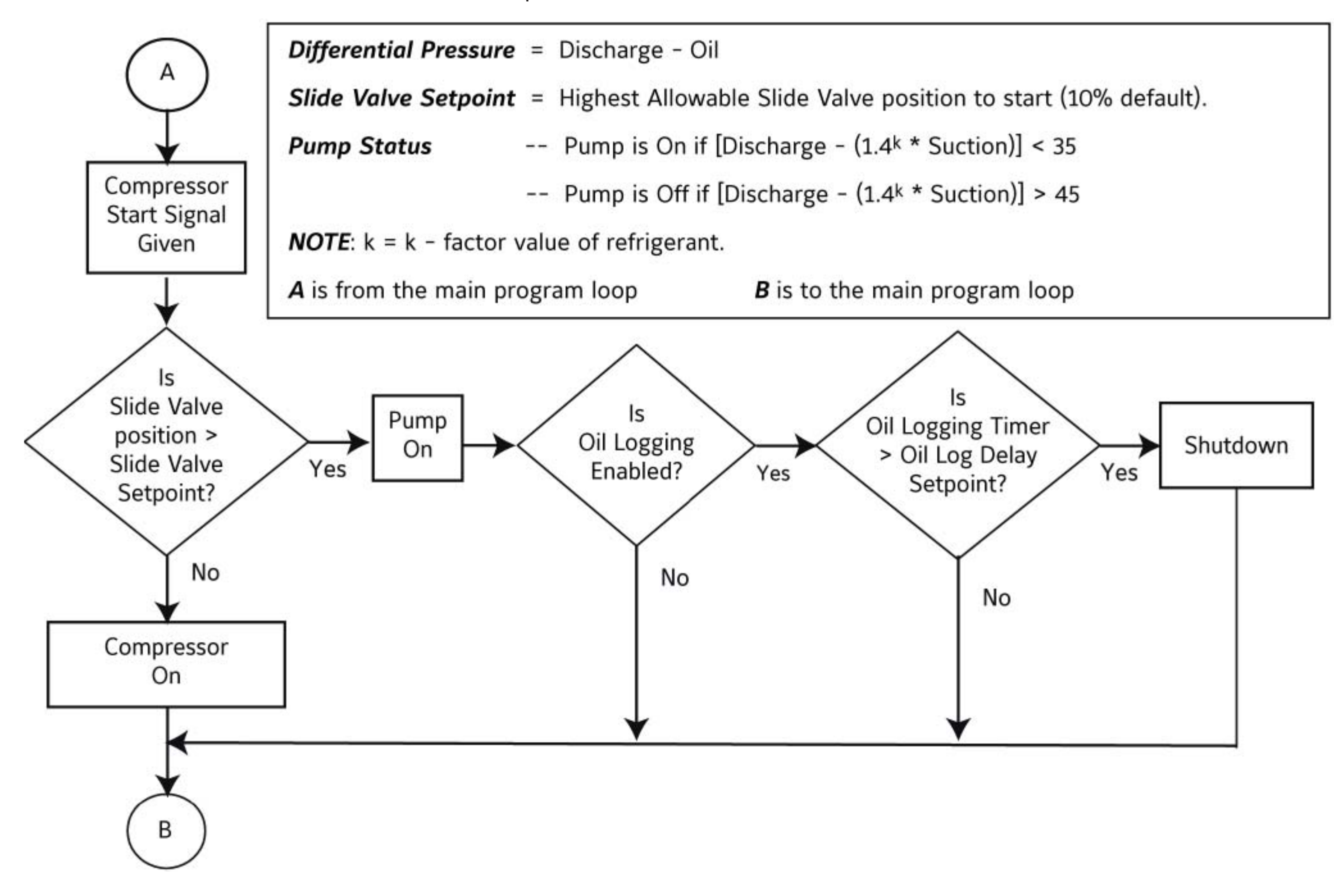




OIL PUMP STARTING LOGIC

Demand Pump

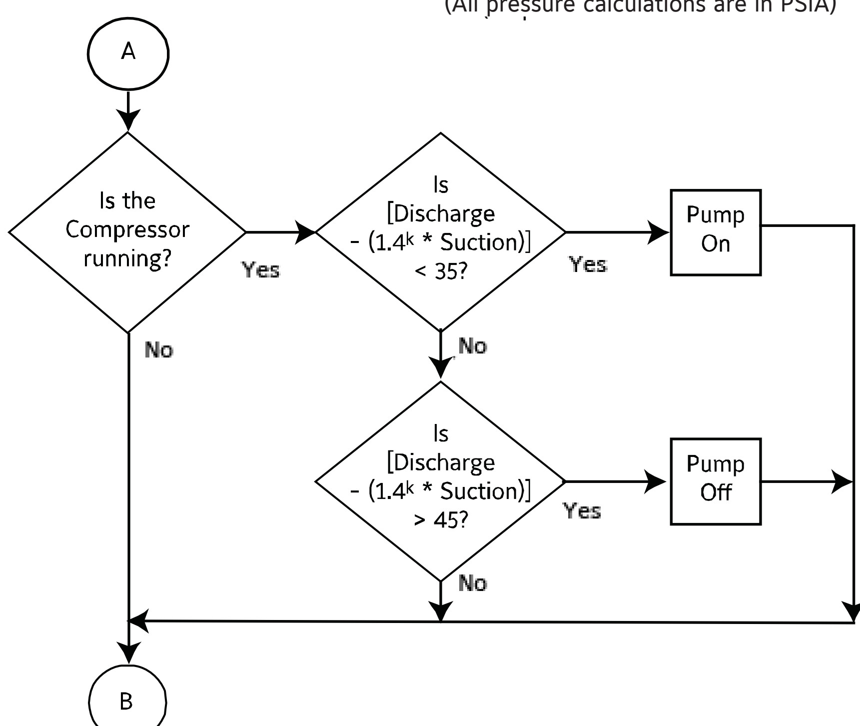
(All pressure calculations are in PSIA)



OIL PUMP RUNNING LOGIC

Demand Pump

(All pressure calculations are in PSIA)



OIL PUMP STARTING LOGIC

Full Time Pump

(Frick compressor only)

(All pressure calculations are in PSIA)

Key

Differential Pressure = Oil - Discharge

Slide Valve Setpoint = Highest Allowable Slide Valve position to start (10% default).

Pump Status = Pump is On

A is from the main program loop ***B*** is to the main program loop

NOTE: If one of the Other Manufacturer Compressor types, then the Oil Pump must raise the Oil Pressure per the following calculation before the compressor can start:

Poil-Pdisch > (Low Oil Pressure shutdown + 10 PSI)

If the above calculation is true for 5 seconds, the compressor can start.



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